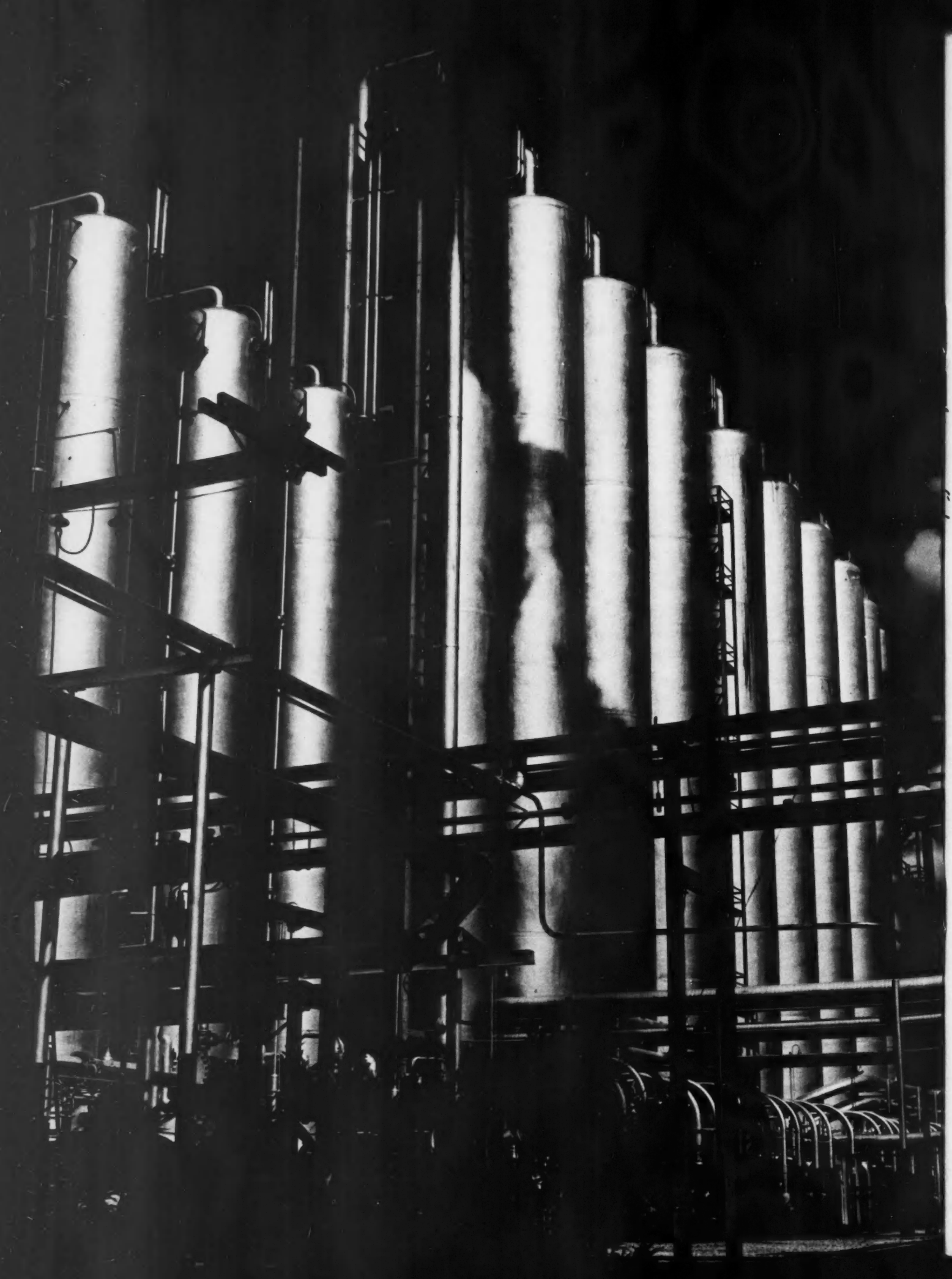
Oil Field Souvenir

The HUMBLE WAY

JANUARY-FEBRUARY, 1946



The HUMBLE WAY

Vol. 1 JANUARY-FEBRUARY No. 5

GASOLINE LINE TO NORTH TEXAS

THE STATE'S first gasoline pipe line leading from the Coast to north Texas will be built by Humble Oil & Refining Company this year at a cost of approximately $3,000,000, it was announced recently. The 265-mile eight-inch line will be laid from the Company's Baytown refinery to a terminus on the north highway between Dallas and Fort Worth, located approximately 10 miles from the former and 20 miles from the latter.

Purpose of the line is to bring to a greater number of Texas motorists the high quality gasoline made possible by the wartime installation of advanced refining equipment at Baytown refinery. Two giant fluid catalytic cracking plants and other modern units built by the Company to meet production demands for 100-octane aviation gasoline and other war products were quickly converted after the fall of Japan. Quick conversion of these and other wartime units to peacetime production enabled the Company to be the first on the market in Texas with better than pre-war gasoline. Prompt and widespread acceptance of the new Esso Extra and Humble gasoline gave rise to the need for the products line to facilitate the delivery and distribution of gasoline into the heavily populated areas of central and north Texas.

To make this distribution practical over the widest possible area there will be built on the line three terminals in addition to the one between Dallas and Fort Worth. Beginning at the lower end of the line, the first of these will be at Little York, north of Houston; the second at Hearne; and the third at Waco. Storage and distribution facilities will be constructed at each of the four terminals, and it is anticipated that a considerable portion of the state's greatest consumer area will be brought within truck delivery range from these four points.

All construction details will be supervised by Humble Pipe Line Company, and actual work of building the line is expected to begin as soon as pipe deliveries begin. The entire project is expected to be completed within about six months after work is started, according to Humble pipe line engineers. Upon completion of the line and terminals, Humble Pipe Line Company will operate the line and the Sales department of Humble Oil & Refining Company will be in charge of terminals and distribution facilities.

The eight-inch line will be of all welded construction. It will be double coated before being laid in the ground—that is, enamel covered with a special wrap, followed by a second coat of enamel and the final heavy felt wrap.

Two modern, all-electric pump stations will be built on the line—the originating station at Baytown refinery and a booster station at Hearne.

Thus before the end of the year it is expected that Humble wholesale and retail outlets in a considerable portion of Texas will be receiving gasoline directly from terminals on the new line—quality gasoline made at Baytown, the nation's Number 1 petroleum war plant, and transported to market through the state's first Coast-to-north-Texas products line.

ARTIST E. M. SCHIWETZ drew extensively from his storehouse of knowledge of the Texas oil industry to paint the series of excellent water colors appearing on the cover and in the special historical section in this issue. A native Texan, Mr. Schiwetz has spent much time during the past 20 years in studying Texas oil and has done considerable research in tracking down the colorful early background associated with boom towns and flush production. With brush, pen, and pencil he has compiled an artistic record of the growth of the industry that is extensive, colorful, and authentic.

GLEAMING TOWERS of the fractionating section at Baytown Ordnance Works

UNDER THE MICROSCOPE CORRODED ALLOY SAMPLES TRAPPED IN GLEAMING LUCITE, YIELD THEIR SECRETS TO SCIENTISTS

TRAPPING METAL MICE

Mechanical, chemical, and electrical methods employed to combat outside and inside corrosion in refineries

THE MANY SCHOLARS responsible for developing our language were a logical and descriptive lot. Any student of word derivations will point out, for instance, that the word *corrosion* comes from a combination of the prefix *cor-* (together) with the Latin verb *rodere*, meaning "to gnaw; to eat away by degrees as if by gnawing." If you look far enough, the odds are that our word *rodent* will pop out of the same verb.

"To eat away by degrees as if by gnawing"—there's a colorful and succinct description of metal corrosion! Technical men at Baytown refinery will attest to its accuracy.

Corrosion problems were not too difficult in earlier days, when a few crude shell stills turning out kerosene constituted an oil refinery. Not so today. From the complex maze of modern refinery operations comes a multitude of new problems to plague corrosion engineers. To keep operating costs from soaring, corrosion research men at Humble's Baytown refinery are constantly devising better ways to eliminate or control the corrosion menace. Their duty can be expressed in three words: Save the surface!

Outside metal surfaces, exposed to the oxidizing influence of the salty Gulf Coast air and to the corrosive effects of many chemical fumes, flake away as metallic oxides. But the big problem is to protect *inside* surfaces, where acids and

other corrosive chemicals flowing through pipes and vessels take a terrible toll. Here, even under scientific controls, constant and relentless gnawing of an invisible horde of "metal mice" literally sends hundreds of thousands of dollars down the drain annually.

It is relatively easy to control corrosion of outside surfaces. When it becomes necessary to expose sections of pipes, vessels, and other equipment to the open air, a protective coating of rust preventive, such as Humble's own Rust Ban, is applied. Control of inside corrosion is infinitely more difficult.

In general, this corrosion may be controlled in three ways: (1) Chemically, by using neutralizing or inhibiting chemicals; (2) Mechanically, by employing corrosion-resistant alloys or by changing operating conditions; and (3) Electrically, by the method known as cathodic protection. The first two, employed singly or in combination, solve by far the greatest number of refinery corrosion problems. The third method is more suited to controlling pipe line corrosion.*

Chemical control methods will be taken up first. Tied in closely with chemical means of corrosion control is a testing method known by the cryptic abbreviation, pH. It would not be well to attempt a detailed explanation of complicated chemical terms and formulae involved in the pH method; it is enough to say that pH does provide a highly accurate system for determining the *exact degree* of acidity or alkalinity of an unknown solution. In many cases, the corrosion engineer must have this information before he can proceed with the problem.

Liquids may be tested for pH value either chemically or electrically, but the majority of refinery tests are made in this manner: First, a few drops of specially prepared indicator solution are added to a small sample of the unknown liquid. A definite color develops, and this color is compared with standard color plates giving numerical pH values. The pH scale ranges from 0.0 to 14.0, or from strongest acid to strongest alkali values. Neutral solutions are indicated at mid-scale.

Now to apply this basic pH knowledge to specific corrosion problems:

Objectionable acids and sulphides in crude oils, especially the sour West Texas and Panhandle crudes, were at one time causing considerable corrosion in vapor lines at crude stills. After studying the problem, engineers decided to introduce quantities of ammonia gas into the vapor lines to neutralize the acid-forming elements present. Satisfactory results were obtained immediately from these alkaline injections, and the practice was enlarged and developed into what is now a major project for control of corrosion at Baytown. The details are these:

Liquid ammonia is stored centrally in the refinery and allowed to vaporize into an elaborate piping system which carries the alkaline gas to the units under control. An automatic reducing valve near the storage assures an even pressure of 35 pounds per square inch in ammonia lines, regardless of weather or operating conditions. The gas is precisely injected through flow meters into still vapor lines and other equipment. Ammonia injection rates are indicated by each meter in cubic feet per minute. Rate of injection for each point depends on the kind of oil being processed and the metals used in exchanger tube bundles and other equipment. That's where pH comes in. Metals containing brass and copper resist acids better than alkalis; a slightly acid pH must be maintained on liquids or vapors flowing in this equipment. Just the reverse is true of steel equipment; steel resists alkalis better than acids, so a pH slightly on the alkaline side is maintained.

Daily pH readings are taken at every point. Minor adjustments to ammonia flow rates are sometimes made to bring pH to the desired point. Glass manometers for flow meters are quite fragile, but inexpensive replacements are supplied by the glass blowers and installed by members of the Instrument Department.

In all, there are 31 ammonia installations for corrosion control in the Baytown refinery. Having proved their worth in past years, injection systems have been extended from the crude still batteries to pipe stills, light ends fractionation units, debutanizers, the absorption plant, steam systems, and other sections of the refinery. Central storage facilities have grown from token size to three huge drums, each holding 35,000 pounds of ammonia. Monthly consumption of ammonia for corrosion control purposes averages about 14,000 pounds.

Chemicals other than ammonia are used in the refinery for controlling corrosion. After the light ends section of No. 2 Fluid Catalytic Cracking Unit had been in operation a short time, considerable corrosion of exchanger tube bundles and cooling water distribution lines was detected. Research developed that this was caused by acidification of cooling water by chlorine injection. (Chlorine is injected into practically all refinery cooling systems to control algae and bacteria.) Here was the problem: The Catalyst Light Ends were among the first to use river water for cooling purposes; in the past only well water had been used, but expansion of refinery facilities made it necessary to augment supplies of well

* "Hold that Film" in THE HUMBLE WAY, November-December, 1945.

IN THE FIELD, this permanent electrode assembly measures the acidity or alkalinity of a contiuuously flowing sample. Impulses are sent to a device which records pH values on a paper roll.

water with millions of gallons from the San Jacinto River. This river water lacked natural carbonate material present in well water, and chlorine was uniting with the water to form hydrochloric acid. This acid, in turn, was corroding exchanger equipment. The situation was soon brought under control by precise injection of caustic into the water system. This alkaline chemical neutralized the acid being formed and corrosion was eliminated.

Like all good rodent control systems, those at Baytown are not directed solely toward destruction of the adult mice. Provision is made to destroy breeding grounds, as well. This is done by chemicals which inhibit formation and action of potentially corrosive materials. An example of such control is the addition of Quachrome Glucosate to certain cooling waters to prevent fouling and corrosion of steel heat exchangers using river water.

Another menace brought under control at Baytown was corrosion in steam heaters, reboilers, and condensate return lines. This was occurring only where places in lines and vessels were sufficiently cool to allow condensation of steam. Carbon dioxide in the steam was combining with water to form carbonic acid causing corrosion. This condition was corrected by injecting ammoniated water into the system and controlling pH slightly on the alkaline side.

Naturally, the work of Baytown corrosion engineers would be made easier if chemical means of control were a panacea for every problem. It is all very well to use neutralizing chemicals to fight corrosion caused by materials in the oil itself. But what of cases where acids and caustics must be used in processing oil? That's where alloys come in.

Unfortunately, no single alloy exists to solve every corrosion problem. Wide varieties of alloys are employed, especially the chrome-nickel and chrome-molybdenum stainless steels. The type of alloy to be used is dependent upon acid strength and process temperature.

More sulphuric acid is used at Baytown refinery than any other corrosive material. Strangely enough, weak or intermediate strengths give much more trouble than concentrated acid, which is carried in plain carbon steel lines or vessels. For weak or intermediate (40 to 70 per cent) concentrations, a lead lining, or a combination lead-and-Karbate lining may be used to protect the metal. Karbate is mostly carbon, an acid-resistant material.

Small quantities of hydrochloric acid used in process work are handled with rubber, glass, plastic, or Hastalloy equipment. Caustic corrosion is controlled with either monel metal or nickel linings.

At some units, notably the absorption plant and the debutanizers, a solution of ammoniated water is substituted for ammonia vapors. Operating pressures at these units greatly exceed the 35-pound ammonia pressure, so a chemical injection pump is used. At the absorption plant, portions of the upper section of the Secondary Still bubble tower were being so corroded by organic acids that new liners had to be in-

SCIENTISTS CONSTANTLY SEARCH FOR INFORMATION ON CORROSIVE EFFECTS OF ACIDS AND ALKALIS ON METALS

stalled periodically. Since the introduction of ammoniated water in 1943 and subsequent daily pH tests, corrosion has been negligible, and it has not been necessary to put in new liners or patch corroded sections of the tower since ammoniated water injections were initiated.

Valves, condenser equipment, furnace tubes, lines, and vessels—all must be protected when acids or sulphides are present. Stainless steels containing alloys of chrome-nickel or chrome-molybdenum find wide application in the refinery. There is an especially large tonnage of alloy lines and vessels at the No. 1 Fluid Catalytic Cracking Unit. On the catalyst side of this unit, all vessels except the regenerator are stainless steel with 18 per cent chrome and 8 per cent nickel. The regenerator itself is firebox quality carbon steel containing 5 per cent chrome and ½ per cent molybdenum. The vessel is lined with refractory tile and block insulation.

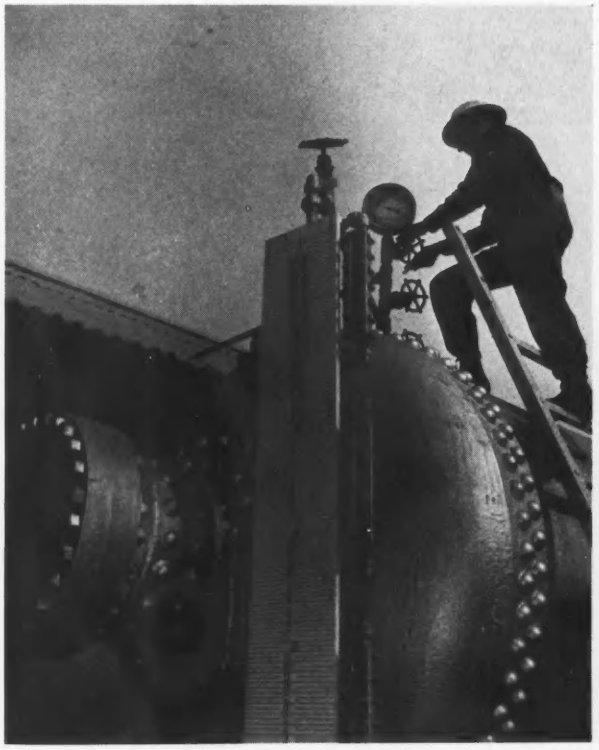
Mechanical protection against corrosion is used to reduce the detrimental effects of sulphides and chlorides present in some oil streams from the crude during early processing stages. In the vacuum tower of No. 2 Pipe Still, which charges "sour" West Texas crude, two means of protection are used. The bottom and upper sections of the tower are lined with gunnite, a sort of concrete. The center section is lined with 12 per cent chrome strip. Gunnite is also used in soaker vessels at the Thermal Cracking Coils, and 12 per cent chrome strips are placed in Ross Exchanger shells at these units. Lower sections of fractionation towers at the fluid catalyst cracking units are protected with Pluramelt, a type of plate composed of a thin alloy liner bonded integrally with a carbon steel backing-up plate.

Still another mechanical type of corrosion control is known as "corrosion allowance." Where corrosion is inevitable, a wall considerably heavier than is actually required by operating conditions is employed. In this way, corrosion does not impair the usefulness of equipment until a specified amount of metal has been eaten away, at which time a replacement is made or a lining installed. For example, a 13/16-inch wall is used in fractionation towers at the fluid catalyst cracking units. About ½-inch of this wall is considered expendable.

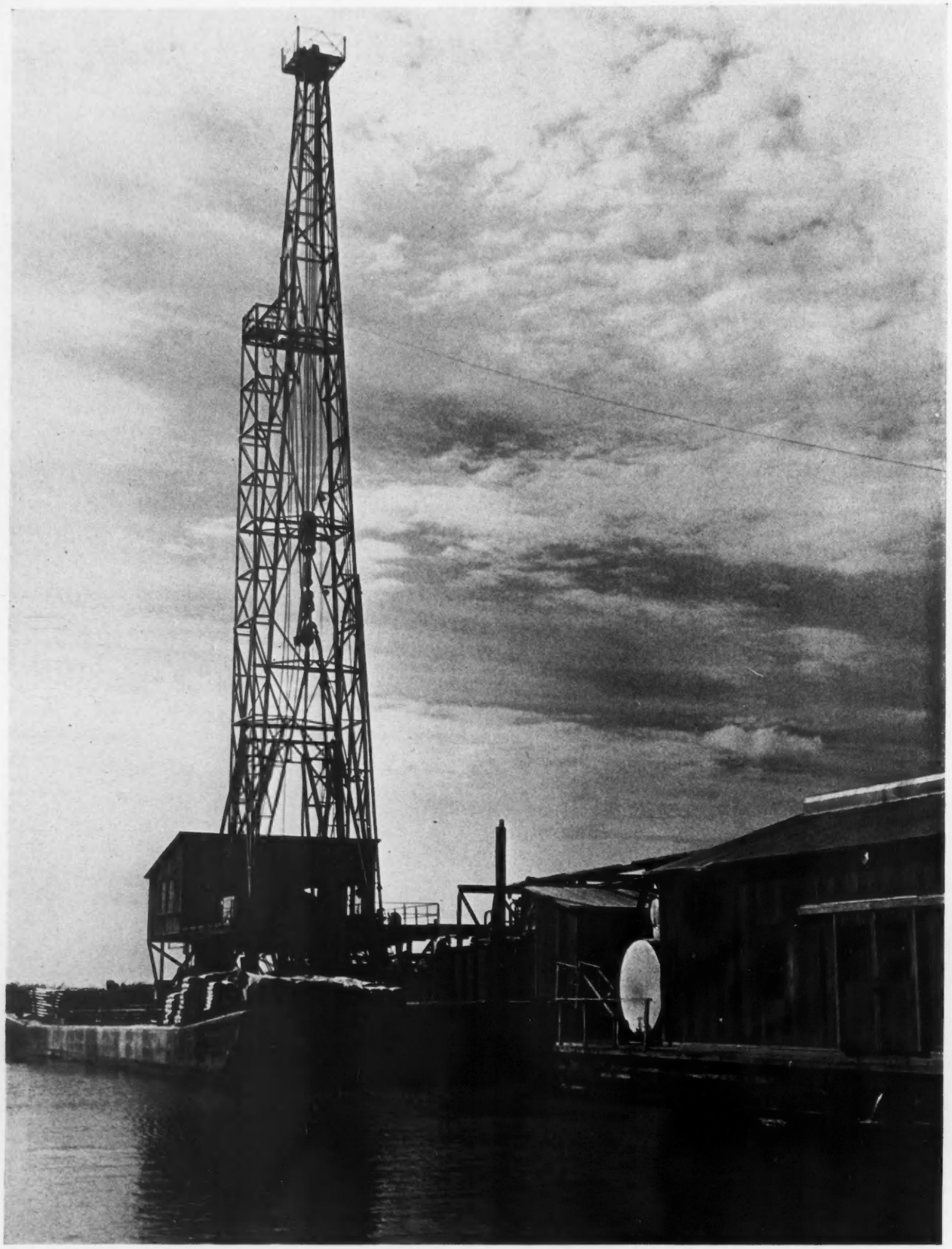
In all cases, economic considerations decide which type of control will be used. Both chemicals and alloys are expensive. If the volume of chemicals necessary to control corrosion at a certain point would be so large that costs would be prohibitive, alloys are used instead.

So, day after day, Baytown experts carry on the never-ending battle against corrosion. Constant vigil is kept in the field, where alert technicians make daily checks on current problems and work to forestall incipient corrosion. In the laboratory, field operating conditions are simulated in small pilot experiments to determine type and extent of new problems. From this work come clues and information used by scientists in deciding proper means of elimination or control of each problem. Such methods protect Humble's investment in physical facilities by adding months, and even years, to the life of metal equipment.

If the wasteful "metal mice" of refinery corrosion cannot in all cases be completely exterminated, it is certain that they will not become sleek and fat off the meager fare remaining to them while Humble corrosion men are on the job.



FROM THIS DRUM holding 35,000 pounds of ammonia, one-third of the total storage capacity, dry ammonia vapors are sent to operating units under corrosion control. Below, a corrosion research chemist takes samples of steam condensate, and tests each for carbon dioxide, excessive amounts of which combine with water to form carbonic acid.



WHEN COLLAPSED THE 129-FOOT DERRICK RIDES ON THE CARRIAGE SHOWN ABOVE FUEL TANK NEAR CENTER OF PICTURE

BARGE WORKOVER RIG

Humble designed collapsible derrick unit, first of its kind, proves successful in Louisiana marshes

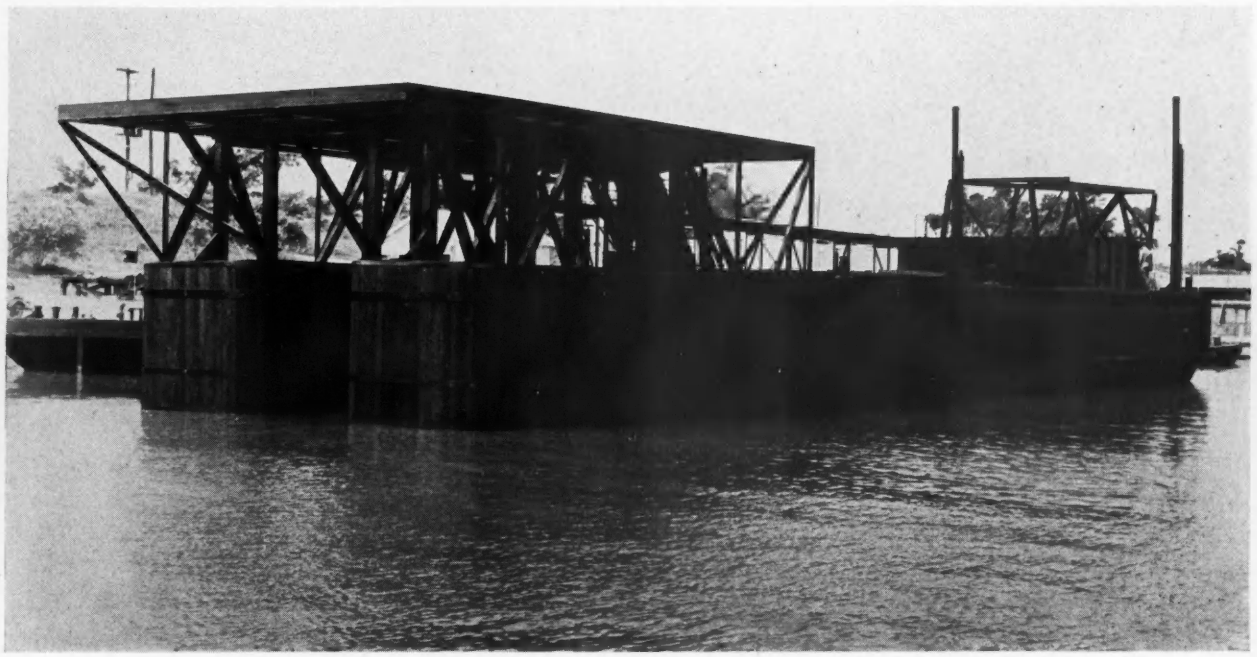
OFF PECAN ISLAND, deep in the marsh country of Vermilion Parish, Louisiana, squats a fat barge. On Humble records it is catalogued formally as Humble Barge Workover Rig 126, but in the petroleum industry it is known as a collapsible-derrick barge rig, a unique piece of drilling equipment.

Practical-minded Humble engineers began to foresee the need for just such a rig, when for the lack of rigs to work over a great number of wells located in the marshes and swamps of the Bayou State, production of those wells fell off. The giant conventional barge rigs were too large, too scarce, and too expensive. Something else had to be devised. That is when the collapsible-derrick rig was born. From an engineer's drawing board to Humble's own construction yard at Barbour's Cut near La Porte, it evolved, until at last a bulky, awkward-looking contrivance plodded steadily through the marshes and swamps of Louisiana, one of the country's first collapsible-derrick barge rigs.

Anatomically, it is comprised of two barges or hulls; one on which the drilling rig proper is erected, and a power barge aft. At remote locations, such as bleak Pecan Island, a

HERE IS SHOWN THE SLOT in the end of the hull which enables the hull to be positioned over the well and well chute. Also shown is the standpipe, house, swivel and other equipment; supply barge at right.

BEFORE MACHINERY AND DERRICK WERE ADDED AT BARBOUR'S CUT THE NOTCHED END BARGE LOOKED LIKE THIS



quarterboat to house the crew is also necessary. The essential portion of the workover setup is a notched-end submergible drilling barge hull (or single barge different from the twin-barge arrangement so common to the conventional type barge drilling rig.)

The drilling barge hull is 29 feet, 3 inches moulded width by 130 feet long by 12 feet deep and is notched at one end with an 8-foot wide notch, 32 feet deep, lengthwise of the hull. The notched end, or slot, enables the hull to be positioned over the well. At the end of the hull opposite the slot, a towing rake is provided. The hull is divided into eleven main compartments, one dry well, and collision compartments, these being formed by two longitudinal bulkheads spaced four feet each side of the longitudinal center line and five transverse bulkheads. With this arrangement, four submergence water compartments are provided along each side of the hull with three, 8-foot wide and 26 feet 8 inches long compartments, and the 8-foot by 8-foot dry well in the center with the dry well adjacent the slot at the end of the hull. The center compartment farthest from the slotted end is arranged for a reserve mud compartment, while the other two are for fresh water storage, and the dry well is a chamber for a centrifugal pump provided for removing the submergence water and fresh water for raising of the hull. The hull is jacketed along the sides with pitch, tar-paper, pitch, and then 3-inch thick creosoted lumber placed vertically and held by angle iron at each end, metal straps, and bolts.

On the slotted end of the hull is a superstructure which extends out past the end of the hull approximately 8 feet and with the flooring 9 feet 9 inches above the deck of the hull. The over-all length of the superstructure, including the overhang, is 42 feet and it is the full width of the hull. The footings for the derrick are built into the superstructure. The lay-down type derrick rises 129 feet above the derrick floor, upon which is the drawworks driven by an electric motor. A structural platform is provided on the opposite end of the main barge to support the derrick when it is in the lowered position.

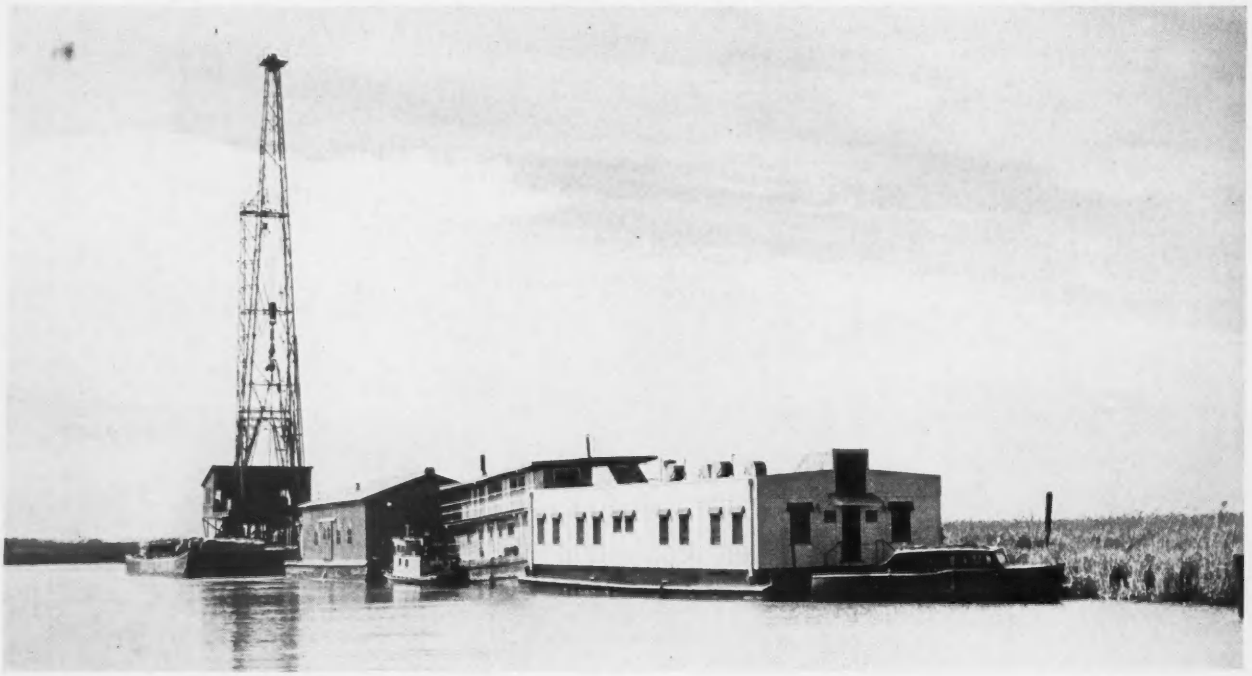
The derrick rests on the barge and embodies an "A" frame 20 feet high to which the fore portion of the derrick is fastened. The "A" frame serves as a fulcrum when lowering and raising the derrick. When the derrick is lowered, the pins holding the derrick are removed and the drawworks, beneath the "A" frame and attached to a pulley arrangement on the "A" frame itself, controls the lowering or raising of the derrick. Furnishing the bulk of power through electric generators and motors are three Diesel engines, aggregating 745 rated horsepower, on the wooden-hulled, floating type power barge. The whole process of raising or lowering the derrick can be completed in twenty to thirty minutes.

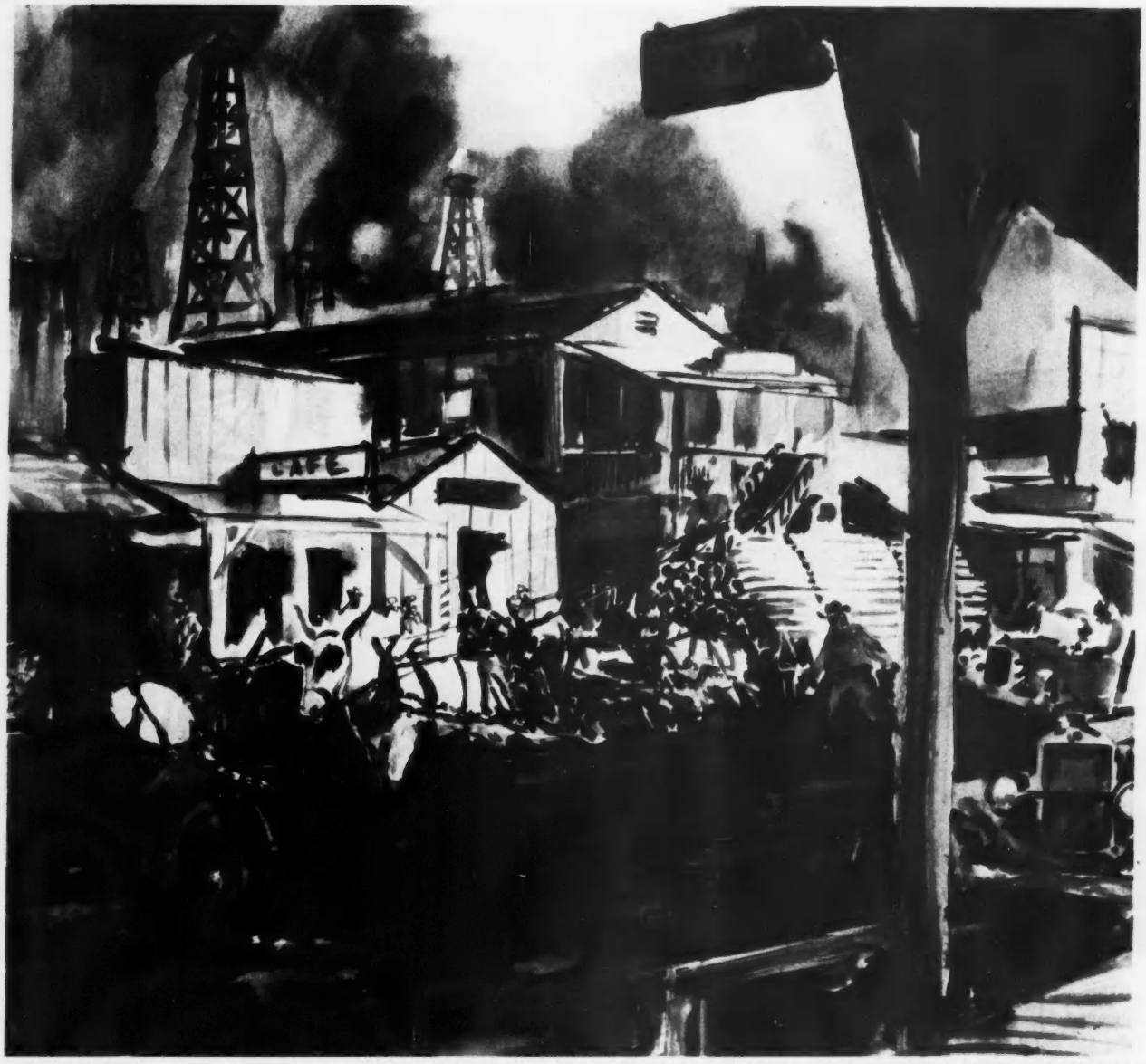
When fully rigged up and at work over a well the unit looks very much like any other barge drilling unit or workover rig, but when being towed from one location to another it presents somewhat of a strange picture. The collapsed derrick sticks out over the end of the platform at the rear of the barge and the overall appearance is something like a huge fire truck with its ladders stacked on top.

Advantages of the collapsible-derrick barge workover rig over the usual type are many. The initial cost is much less as are operating and maintenance costs. Too, transporting it proves to be a vastly easier and much swifter process.

Even now, as Humble Barge Workover Rig 126 is operated in the cold and windchafed marshes on Louisiana Furs, Inc. lease around Pecan Island, Avery Island District, it is pioneering a new design of rig which was born of necessity and was the direct outgrowth of the active resourcefulness of Humble engineers.

FULL VIEW OF SET-UP AT PECAN ISLAND SHOWS RIG, POWER BARGE, HOUSEBOATS FOR CREW MEMBERS, SUPPLY BOATS





TALES OF THE SKILL AND PROWESS OF TEAMSTERS ARE PART OF THRILLING STORY OF RANGER AND OTHER BOOM TOWNS

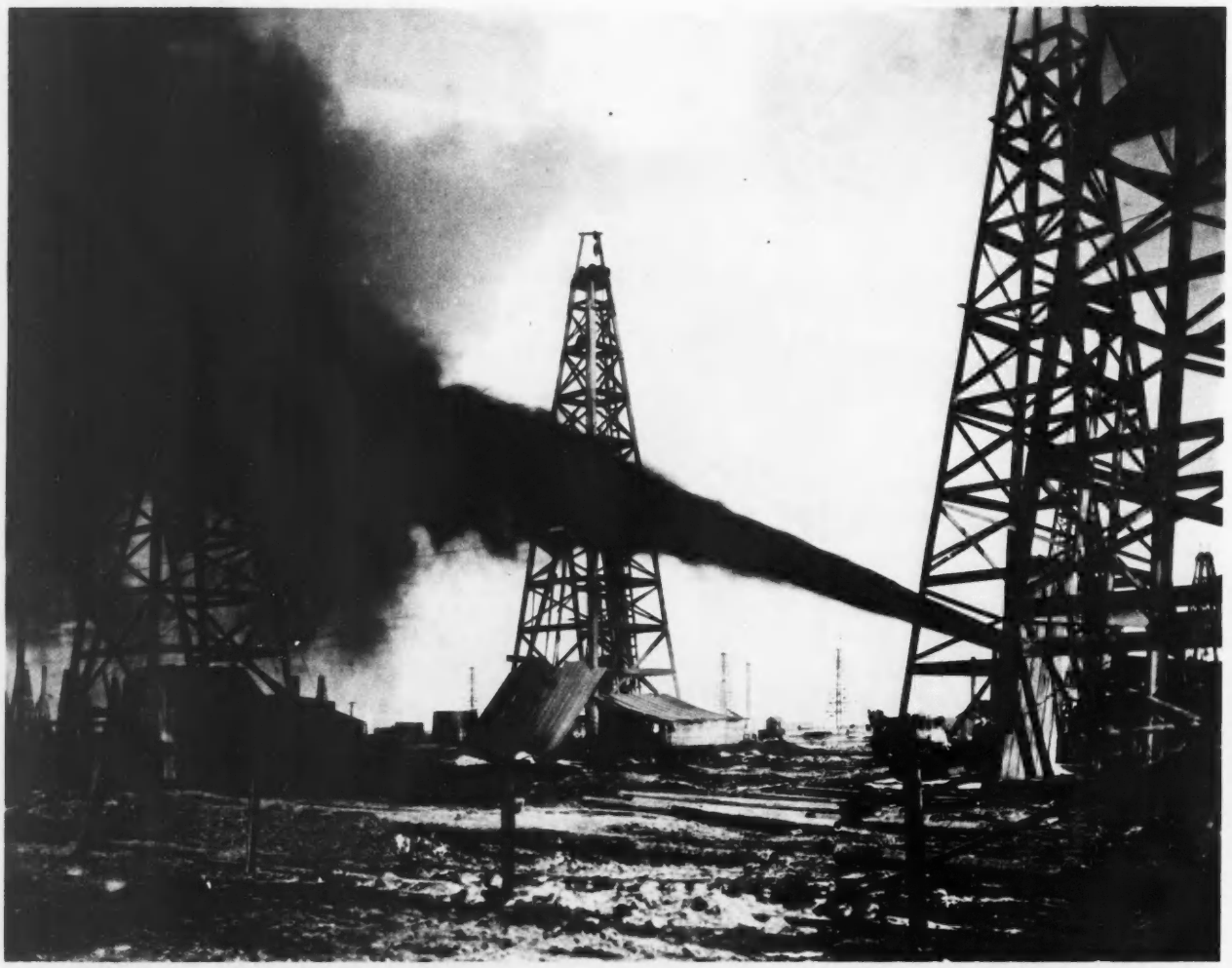
Highlights of TEXAS OIL

THE stranger in Texas asks to see three things: the Alamo, a cowboy, and an oil field. If you say "Texas" to the man-in-the-street of New York or Kalamazoo, of London or Capetown, the chances are even that he will think, "Oil." In less than half a century, oil has become of paramount importance to Texas, and Texas has become the center of the oil world.

It would take many chapters, and even volumes, to tell the complete history of the economic, social, and business aspects of oil in Texas. The full story is a long and ramified one that cannot be covered adequately in a brief space. It is a fascinating one, however, full of many colorful episodes. This sketch must necessarily limit its scope to some highlights in the chronology that will introduce the reader who is not familiar with the industry's development to the romance of Texas' oil.

I.

The span of human life on Earth, measured in geologic time, is very short. The formations of sand and limestone from which we produce oil are hundreds of centuries older than the earliest prehistoric man. Oil in Texas, therefore, goes back before our recorded history. When the Persian



IT WAS A COMMON OCCURRENCE AT SPINDLETOP TO OPEN WELLS TO IMPRESS VISITORS AND INVESTORS FROM AFAR

Zoroastrians were tending the sacred fires of natural gas described by Herodotus, some Texas Indian was, perhaps, bathing his wound with the oil from seepages near Sour Lake or Sabine Pass.

However that may be, oil enters the pages of written history in Texas before either the romantic adventure of Pocahontas and John Smith in Virginia or the arrival of the Pilgrims on Cape Cod. The year was 1543, and survivors of De Soto's expedition, coasting the shore line from Louisiana to Mexico, stopped in the neighborhood of Sabine Pass to patch their leaking boats with the asphalt deposits which covered the shore in that vicinity. Again, in 1790, about the time that George Washington was recording in his will those lands in Pennsylvania which contained a "burning spring," the Spanish settlers at Nacogdoches and San Augustine used oil from a spring and small creek in Nacogdoches County as external medicament for man and beast and to lubricate the noisy wooden axles of their two-wheeled carts.[1]

Those were the beginnings, and if they are more modest than the well known stories of the bottled "rock oils" of the Eastern seaboard, it is probably because there were fewer people in Texas.

But it is unthinkable that so useful a servant of the budding industrial age as petroleum should remain a lubricant for complaining axles and a medicine of somewhat doubtful therapeutic value. Nor did it. Early industrialists in Pennsylvania used local sources of natural gas and crude oil for fuel. A professor at Yale University reported that numerous useful products—notably kerosene—could be obtained from petroleum. Then, in 1859, Colonel Drake drilled that first, famous oil well in America on Oil Creek in Pennsylvania. Thus began the first chapter in petroleum production—oil for the lamps of the world. High-born ladies might sniff at the odors of kerosene—or coal oil as it was generally known—but the world used it and "coal oil Johnny" went to town.

All this is important to a story of oil in Texas because it stimulated a search for oil, and resulted in the first oil well in Texas. It was begun near Oil Spring in Nacogdoches County in 1859 by Lynis T. Barrett. The War between the States transferred Mr. Barrett's interest temporarily to soldiering in the Confederate Army, but on his return, in 1866, he brought in a well capable of producing 10 barrels daily.[1] Not much resulted from this well except an interest in oil

among Texans. A showing of oil was found, here and there, in the course of drilling for water. A few wells were actually completed as oil producers, but Pennsylvania had the lush production, the markets, and "the play."

Nevertheless, *Burke's Texas Almanac* for 1880 evidenced Texas' continued interest in oil. N. A. Taylor was the author of an article which began, "There is, I believe, a river so to call flowing through the subterranean cavities of Texas. I believe it takes its rise in the carboniferous strata north of the great bend of the Colorado above Lampasas." Mr. Taylor traced his river of oil from Lampasas to the Gulf, and concluded his piece with his interesting question: "How do we know but what this river of petroleum may not pass through subterranean cavities under the Gulf and be the same that at last boils up in Trinidad, making the great lake of asphaltum?"

Fifteen years later, in 1894, the American Well and Prospecting Company, drilling for water at Corsicana, struck oil instead.[1] It was a deal of trouble, that oil, and it was only with great difficulty that the drillers made their water well by drilling through the oil sand to the artesian water below it! Alert men gave more thought to the oil than concern to the well. Several leases were executed, and in 1895 an oil well was brought in and Corsicana became a field with a respectable production for the time. Lacking a refinery, the Corsicana producers sold their oil as fuel for drilling rigs, and to Austin and Dallas for the manufacture of gas. After several years and many disappointments, arrangements were finally concluded to build a refinery at Corsicana. In 1898 this refinery was completed and Texas oil products took their small place in the market.

Production at Corsicana, according to the "Derrick Handbook on Petroleum," published at Oil City, Pennsylvania, in 1898, was 1250 barrels daily. The 113 wells in the field, including 13 sad dry holes, provided employment for 200 men, with a daily payroll of $400. The Handbook characterized Corsicana crude as "an unexcelled product for illuminating oil."

[1] "Texas Oil and Gas Since 1543"—C. A. Warner.

II.

The turn of the century really brought Texas to the beginning of its modern oil history. The year was 1901, the date was January 10, and the field was one whose fabulous story stirred the world—Spindletop. The story of Spindletop, like that of many later fields, was one that began years before the actual discovery of oil. It is a record of many, many difficulties covering a period of nearly ten years. As early as 1892, Patillo Higgins of Beaumont "was convinced that the presence there of gas seeps, mineralized waters, and a topographic elevation were phenomena of importance as well as interest." The more he "studied the ground," the firmer became his conviction that there was oil under a low hill about five miles from the heart of Beaumont. The hill was 20 feet higher than the surrounding coastal plain and had once been covered by a clump of trees which made it resemble the top of a spindle, at least in the eyes of casually descriptive pioneers.

A LAKE OF OIL created by raising levees around the Lucas gusher caught fire when sparks from a passing locomotive set the prairie afire. Much of the oil went up in a gaudy display of smoke and flame, but fortunately the well came through the holocaust undamaged.

MUCH FEVERISH TRADING IN LAND AND LEASES TOOK PLACE AT BEAUMONT OIL EXCHANGE DURING SPINDLETOP BOOM

Mr. Higgins preached the existence of oil at Spindletop to all who would listen. He was discouraged, he was ridiculed. Nevertheless, he persevered. Oil was there, he told people, over and over again—oil, natural gas and, perhaps, sulphur. Two Beaumont men became converts to his theories, lumberman George Carroll and lawyer George O'Brien. A company was formed with some 3500 acres of land as capital, and Mr. Carroll guaranteed the money on which to operate.[2]

So with high hopes the Gladys City Oil, Gas and Manufacturing Company, taking its name from one of Mr. Higgins' Sunday school pupils, began a well. In the course of drilling, nearly every imaginable difficulty was encountered, from collapse of the derrick to virtual isolation by floodwaters. It added up to more than the young company could stand and the test had to be abandoned. But a showing of gas was obtained at 60 feet.

Another test was drilled, and it, too, was a failure. But Mr. Higgins kept trying to interest his fellow townsmen, and might have succeeded except that a state geologist who visited Spindletop was quoted in the newspapers as saying that there was no oil.[2] So Mr. Higgins advertised in other fields. His advertisement brought an inquiry from a Captain Anthony F. Lucas of Washington, D. C.

Captain Lucas was not an oil man. An Austrian who had served in the Navy, he had become a mining engineer when he immigrated, and had been retained to investigate the salt possibilities of Jefferson Island, in Louisiana.[3] There he became interested in sulphur, and it was the possibility of finding this element which attracted his attention to Spindletop.

He came to Beaumont, conferred with Mr. Higgins, and decided to drill for oil. Captain Lucas' immediate concern was the manifold difficulties of drilling an oil well in unproved territory. As a practical man, he probably studied the problems encountered in the earlier attempts to hnd oil on Spindletop, and took such precautions as he could to solve or evade them.

His well went deeper than the others, and it did find oil. Not much, but some. Then quicksand caught him and he had to stop. At the same time that frequent embarrassment of the wildcatter—finances, or, rather, lack of them—rose to plague him. Captain Lucas was not one to give up quickly when the first effort failed. If more money were needed, he'd try to find that, too. He packed a sample of the Spindletop oil and went to Pittsburgh. There he interested the firm of Guffy & Galey, and they agreed to back him for another try.

The new well was started on October 20, 1900, using one of the early rotary rigs instead of cable tools. By January 10, 1901—45 years ago to the day as this is written—the well had reached a depth of 1160 feet. Drilling had stopped to change the bit; the crew had about 700 feet of drill stem back in the hole when the rotary mud began to flood over the rotary table. Then the four-inch drill pipe came out of the hole. It skyrocketed, knocked off the crown block, and broke off into lengths of several joints as it shot upward. Then there was a roar of gas. And that was all; the well was very quiet.

Now listen to Al Hamill, who was working with his brother Curt on the well. "We boys," he said, "ventured back—after a wild scramble for safety—to find things in a terrible mess . . . Naturally, we were all disgusted. We started shoveling the mud away when, without any warning, a lot of heavy mud was shot out of the well with the report

[2] "Oil Boom"—Boyce House.
[3] "Texas Oil History"—Manuscript edited by George C. Gibbons.
[4] "American Petroleum Institute Quarterly," January, 1945.

of a cannon! It was followed by gas for a short time, when oil showed up in head flows. In a very short time, oil was going up through the top of the derrick and rocks were shot hundreds of feet into the air. Within a very few minutes, the oil was holding a steady flow at more than twice the height of the derrick."[4]

The news of the discovery spread rapidly through Beaumont. At noon that day the school boys who climbed the tower above the three story Courthouse could see the stream of oil some five miles away rising to a height of over 150 feet. The wind was blowing a fine spray of oil over everything, and the unchecked flow soon created serious hazards. In addition to the damage done by the oil flowing down the streams and bayous, there was the danger of the hydrogen sulphide gas whose deadly effect was not recognized at first.

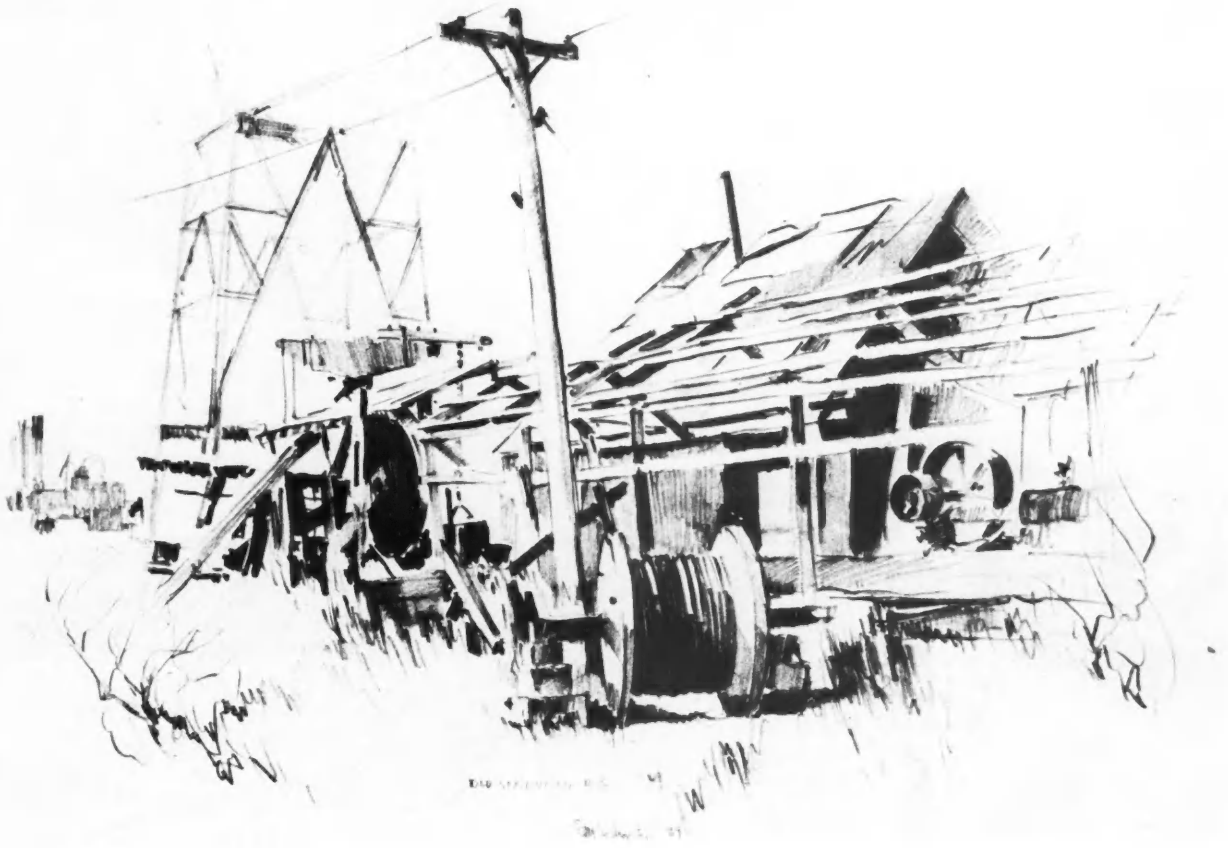
Finally, after nine days of painstaking work, the well was brought under control. It stood then in a lake of oil of some several hundred acres, which had been created by raising levees at strategic spots around the well. Sparks from a passing locomotive set fire to the prairie and much of the oil went up in a gaudy display of smoke and flames. It was a heartbreaking turn of events. Fortunately, not all was lost, for the well came through the holocaust undamaged.

Two more wells were drilled. Then more, and more, until finally there were 500 wells crowded onto a 150-acre patch of land.[3] Wells were so close to each other and leases so small that sometimes a driller would have to rent space for his boiler on another man's land. A picture of the field at the time survives—you could have stepped from the floor of one derrick onto that of the next. This was the wasteful pattern of oil booms that was to be repeated so many, many times before men learned, by bitter experience, the need for orderly development.

The oil strike at Spindletop drew men from everywhere. Nobody knows how many people were drawn to Beaumont by this momentous event. The "Hill" was the new Golconda, and the prospect of oil appeared to be the new road to riches comparable to that of gold in '49. Stories of sudden wealth were common as pig tracks in the piney woods. Profits ran as high as 500 per cent in a few weeks time. A young man from Dallas arrived with $136 in his pocket, and within three weeks he had banked $65,000.[2] There is also the well known story, probably apocryphal, of the man who came across a five spot while counting out one hundred dollar bills for a trade. He looked startled and tore it up, exclaiming, "You don't amount to anything around here."

The promotors quickly capitalized on the speculative appeal of the black gold. Prospectuses were issued by the hundreds, and their promises of sudden wealth distributed far and wide. The promoters played on the credulity of the

CABLE TOOL RIGS ARE SOMETIMES USED TODAY ALTHOUGH ROTARY EQUIPMENT PROVED SUCCESSFUL ON LUCAS WELL



uninformed with statements such as these: "One hundred dollars invested in this company should make you independent for life"; "This stock may be worth five to one in thirty days"; "No grief, no drilling, just profits."[2] Special trains brought "investors" from Texas cities and from as far away as New York and Washington. It was a common occurrence for wells to be turned on to flow as much as possible to impress these visitors. An oil exchange sprang up in Beaumont, and many stocks were wildly traded in during the financial frenzy.

How many of the bright stock certificates, fancifully decorated with imaginary gushers, must lie forgotten in attic trunks today? It was a long time before the industry overcame the mistrust created in the minds of many who were mulcted of their money in those early days.

In the midst of the frenzy, there was the sanity of some solid men. It was the time when far-sighted men began to organize their companies with business acumen, and to lay the foundations of the orderly industry we know today. Many of the great names in the record of oil in Texas, both individual and corporate, first became identified with oil at Spindletop. The origins of the Gulf Oil Corporation trace back to Guffey and Galey, backers of the Lucas discovery well, and the beginnings of the Texas Company and other organizations now well known date back to these early days. Several of the men who were to organize Humble Oil & Refining Company in 1917 also had their first experience with oil at Spindletop.

Spindletop fired the imagination of millions and stimulated the search for oil in Texas, but it was not the source of such fabulous wealth as popular fancy would like to believe. The field produced about 42,000,000 barrels in the first ten years, at the end of which time it was producing only 900,000 barrels a year. Then, too, the price of oil was driven to a very low level by the rapid rate of production. Producers often received only three to ten cents a barrel, and probably did not average over 50 cents, so that the gross income, spread as it was among so many producers and wells, was not spectacular. It took some time to build up a market for the fuel oil which could be made from Spindletop crude, which was not suited to the manufacture of kerosene, and by the time that happened, the flush production was gone and interest had passed on to other areas.

III.

The first two decades after Spindletop proved rather disappointing in Texas. It soon became evident that oil was not to be found everywhere just by drilling wells, and many were disappointed by the large number of dry holes. True, there were some new discoveries based on surface evidences similar to those at Spindletop, such as Saratoga and Sour Lake in 1902, Batson in 1903, and Humble in 1905. The

PISTOL HILL IN EAST TEXAS WAS ONE OF THE LAST BOOM TOWNS—LATER CAME CONSERVATION, ORDERLY DEVELOPMENT

year 1905, however, marked a peak in Texas production and thereafter output declined until by 1910 it had dropped back to a level of 9,000,000 barrels, which was less than one-third of the 1905 average. During the interval, interest had shifted to Oklahoma and California, which had discovered large and important new fields and had become the first and second ranking producing states, far exceeding the output in Texas.

Efforts to discover oil persisted throughout the period, however, and were rewarded with some success following 1910. Electra was discovered in 1911, Burkburnett in 1912, Iowa Park in 1913, a deep sand at Sour Lake in 1914, a deep sand at Goose Creek in 1916, Ranger in 1917, and West Columbia in 1918. By 1917, production in Texas had again reached a new peak of 32,400,000 barrels, but it was still far below that of California and Oklahoma.

The spectacular growth in Texas crude oil production began in 1919 when the development of production in the Ranger area and Burkburnett was being carried on at a frenzied pace. The discovery well of the Ranger field in Eastland County was completed in October, 1917. As more wells were drilled, production increased rapidly until it reached a peak of 80,000 barrels daily in July, 1919. Another important North Texas field, Burkburnett, reached its maximum rate the same year. The discovery of the Burkburnett townsite pool, which occurred six years after the small initial development in 1912, was made by a farmer, S. L. Fowler, who decided to drill for oil before selling his land.[3]. The well was completed as a large producer in July, 1918, and a year later the field was producing 120,000 barrels daily. Ranger and Burkburnett were among the most widely known boom towns, typical of others to follow later.

This was the time when the pattern of the oil boom was set and the mushroom towns that sprang up on the edge of the fields reached their spectacular peak as the price of oil climbed under the stimulus of wartime demand and the inflationary boom that marked the close of the war. The boom carried oil prices to a peak of $3.50 a barrel in 1920 at Ranger, but even so, many companies lost money because too many wells were drilled. This was the beginning of the period of great pipe line construction to link the fields with the refineries and shipping terminals on the Gulf Coast.

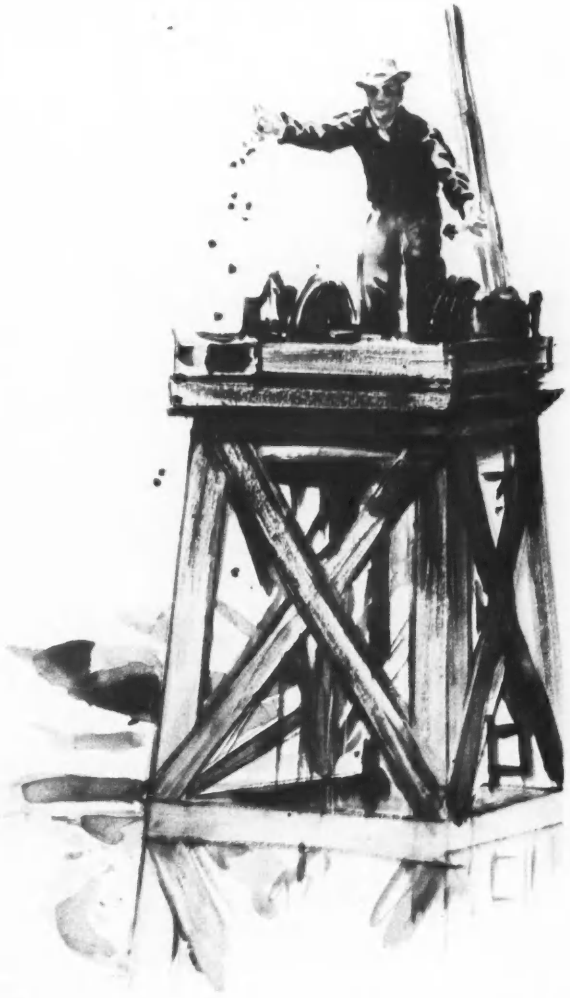
It marked the end of one phase of production in Texas and the dawn of a new era that was to be so intimately related with the development of the automobile.

IV.

With the return to normal after the first World War, there was significant change in the Texas oil industry. The demand for petroleum products was growing by leaps and bounds and the haphazard methods of earlier days were no longer adequate to provide sufficient oil. While chance and luck continued to play a role in the industry, their importance diminished and new scientific methods came to occupy a dominant place in the operations of the industry through the twenties and thirties. The period of the twenties marked the emergence of the Texas oil industry from adolescence into adult life. There were still some booms—Mexia in 1920, Powell in 1923, McCamey and Borger in 1925, and Yates in 1926—but more orderly conditions were being established as the years went by.

The days of regulated production, when the industry would be placed on a stable basis, were drawing nearer.

The first systematic application of technical methods of exploration did not occur generally until the early twenties.



NEAR BIG LAKE in 1923, the operator of a wildcat well was asked by backers to climb to the top of the derrick when the well was spudded in, sprinkle the petals of a rose on the drilling rig, and christen the well *Santa Rita*. After many difficulties the well was brought in and opened up the rich oil fields of West Texas.

Oil was still "where you find it," but increasing emphasis was placed on the scientific methods of exploration. Companies began to employ geologists to map the stratigraphy of the state in the search for structures favorable for the accumulation of oil. Drilling was carried deeper and became more expensive, so that men were forced to consider more carefully before venturing their capital in new wells. The young science of geophysics which endeavored to find oil structures by the use of physical and geologic principles was first practiced in the Gulf Coast in 1922. Although imperfect at first, it gave confirmatory evidence of the existence of structures. Within a few years, geophysical explorations were being carried on extensively. The discoveries of Allen, Fannett, Long Point, Nash, and Orchard in 1924 and 1925 were credited to geophysics. Later discoveries by this same technique included Sugarland in 1928, Conroe and Thompsons in 1931, Hastings in 1934, Anahuac in 1935, and Webster in 1937. But this carries us beyond some of the events in the chronology that must not be overlooked.

V.

The history of Texas' oil production during the late twenties is dominated by the development in West Texas. This area was the scene of many dry holes before production was finally established in a small way at the Westbrook pool in 1921. Production from these wells was disappointing and it was not until 1923 that West Texas became a center of interest with the completion of the Santa Rita discovery well in the Big Lake field. Thereafter, the discoveries in the area sent production up by leaps and bounds—McCamey in 1925; Yates, Hendricks and McElroy in 1926; Howard-Glasscock in 1927; and many others. By 1929, West Texas was producing at a rate of 360,000 barrels daily compared with 4,000 in 1924, and was supplying nearly half of the total production in Texas. That was the turning point in West Texas development, for 1930 was the discovery year of the huge East Texas field that was to dominate the Texas oil scene throughout the thirties.

There is an engaging story about that Santa Rita well which bears telling.[3] It was drilled on geological information, but the area was not proved; and, as is so often the case in the history of new oil fields, there were numerous financial crises. The operator went East in search of finances, and among those who invested in the well were two sisters, both Catholics. They suggested that he invoke the aid of Santa Rita, the Saint of the Impossible. "He was requested to climb to the top of the derrick when the well was spudded and sprinkle the petals of a blessed rose on the drilling rig and christen the well 'Santa Rita'." He did just that, and often in later months, he must have thought that Santa Rita truly had the well under her sponsorship, for the impossible was frequently accomplished before the well came in.

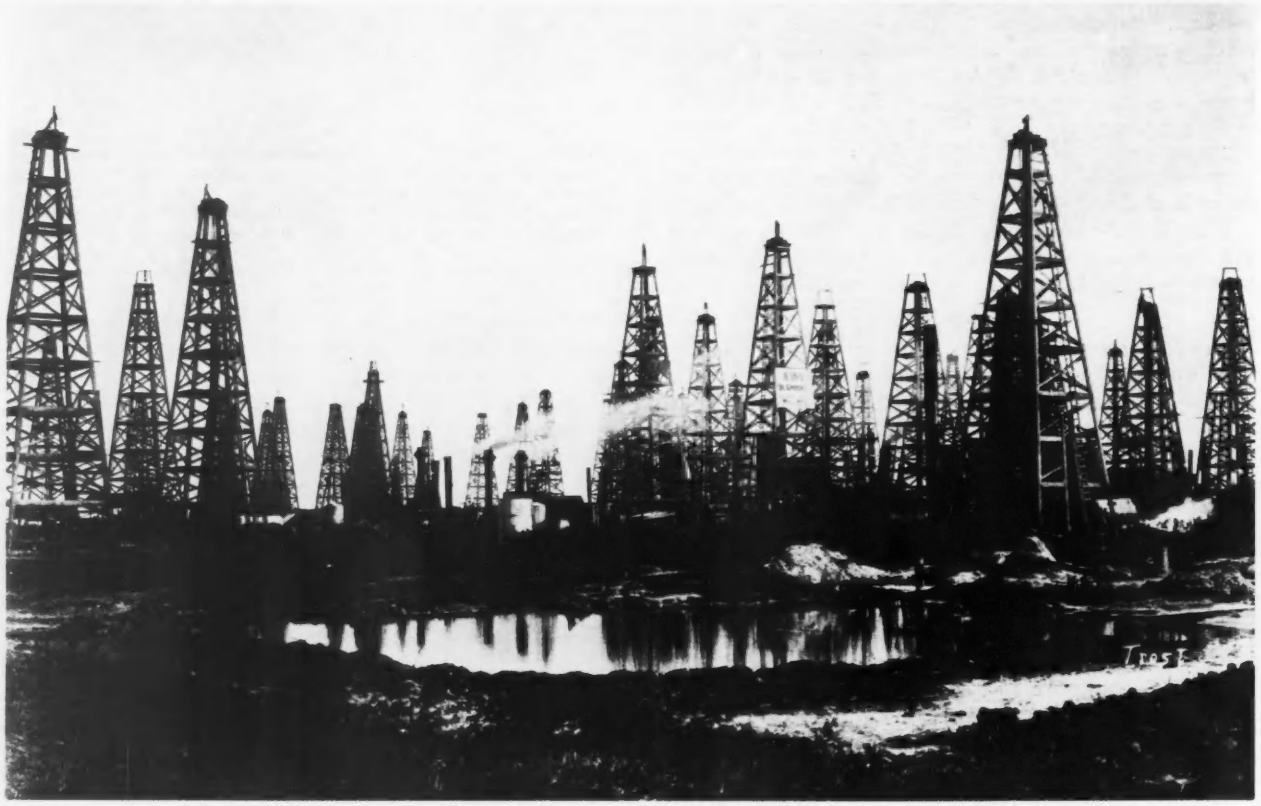
West Texas production is of particular significance to every John Citizen of Texas. Much of it is on lands owned by the University of Texas and Texas A. & M. College. In the two decades since the Santa Rita well came in to prove the Big Lake field, these schools have received millions of dollars of revenue from the sale of leases and from oil royalties.

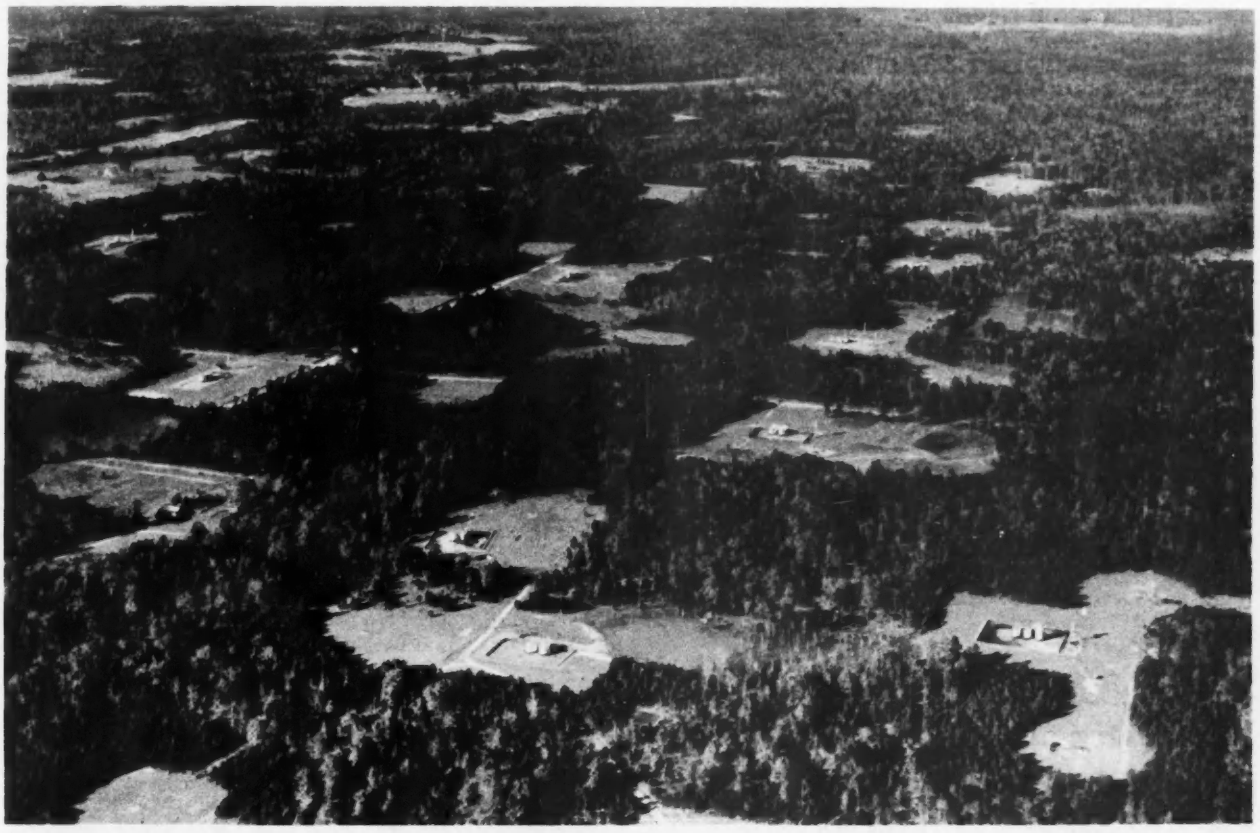
There is another significant highlight to be noted in connection with West Texas. The tremendous flow of oil from the Yates field, which could have exceeded by far the actual peak of 113,000 barrels daily set in 1929, was more than could be handled by the existing pipe line facilities. Accordingly, in order that some producers might not be deprived entirely of their fair share in the market outlet, a system of voluntary proration was established. This was a fore-runner of the proration methods that were later to be embodied in the laws of Texas and applied to all oil producing fields in order to prevent waste and promote conservation. A law passed in 1929, enlarging the definition of waste, was an indication of the trend that was to culminate in comprehensive conservation legislation during the thirties.

VI.

After Spindletop, perhaps the most significant date in Texas oil history is 1930, the year that the greatest U. S. oil field was discovered in East Texas. The search for oil in this area had already resulted in the discovery of Mexia and Powell, but these fields, which were so important in their

THIS WASTEFUL PATTERN OF CROWDED WELLS AT SPINDLETOP DEMONSTRATES THE FRENZY OF BOOM DEVELOPMENTS





THIS AERIAL VIEW OF CONROE FIELD SHOWS WIDE SPACING OF WELLS AND ORDERLY DEVELOPMENT AS PRACTICED TODAY

day, proved small indeed compared with the huge reserve of five billion barrels of oil finally developed in the East Texas field. Although some geologists thought there might be a buried shore-line field in the Woodbine sand, and some leases had been bought by several companies, there appears to have been considerable skepticism about the production possibilities of the area. Finally, through the perseverance of D. M. (Dad) Joiner, the discovery well was completed on October 5, 1930, as a small producer. The proven area of the field spread slowly at first, and then with the rapidity of wildfire. Production was encountered at 3,700 feet, drilling was easy and inexpensive, and soon there were hundreds of wells being completed. The field covered the vast area of 140,000 acres, extending over 40 miles in length. Due to the distribution of land ownership and the competitive urge to get as much oil as possible, more than 25,000 wells were drilled ultimately in this field.

The growth in production from the East Texas field was spectacular. Starting from zero in October, 1930, the output built up to an average of 300,000 barrels daily in 1931 and 580,000 in 1933. At times, the rate was far above these averages, as indicated by the peak of more than 1,000,000 barrels daily early in August, 1931. This flood of oil brought about the last great oil boom in Texas. It also brought about chaotic conditions in the industry, for the excess of supply in the face of declining demand during the depression drove the price of oil down to 10 cents a barrel and less. The physical waste incident to such development was intolerable, and it soon became evident that some state control was required to prevent waste and establish order.

VII.

The conservation legislation which was adopted in 1932 was not something developed full-grown overnight. It was the logical outgrowth, doubtless hastened by the critical and chaotic conditions created by East Texas, of early legislation dealing with conservation of the state's resources.

As early as 1899, the Legislature had passed House Bill No. 542, entitled "An Act to Regulate Drilling, Operation and Abandonment of Petroleum Oil, Natural Gas and Mineral Water Wells, and to Prevent Certain Abuses Connected Therewith." This act provided for the encasing of a horizon through which an operator drilled, for the secure plugging of abandoned wells, for the shutting in of gas wells not utilized for heating, light or power, and for a penalty of $100 for violations. In 1905, other sections were added to the act which stipulated that if the drilling of a well resulted in ". . . a flow of salt water or fresh water injurious to any oil well or wells already bored, or to any oil or gas deposits, and which shall or may probably result in the injury of such oil or gas field or to such oil or gas wells already bored . . ." the well should be cased off, and if this did not stop the flow of salt water, the well was to be plugged and abandoned. The penalty was heavier—not less than $500 nor more than $5,000.[1]

These legislative acts were followed by the act of February 27, 1919. This act made the State Railroad Commission the

agency for the conservation of the oil and gas resources of Texas. It was implemented with the establishment of regulatory rules by the Oil and Gas Division of the Railroad Commission on November 26, 1919. There were 38 in number. Rule 37 is the most famous; it provides machinery for the orderly production and conservation of oil with due regard to the equitable rights of various lease owners. This law marked the beginning of effective conservation efforts in Texas.

The next important steps in conservation came with the passage of a law in 1929 and the Market Demand Act in November, 1932, which was a result of the situation in East Texas. It is sufficient to say here, without tracing the intricate legal history of conservation, that these laws have continued in effect, with certain added provisions for enforcement, and provided a sound basis for waste prevention. The value of such laws to the national interest was amply demonstrated during World War II, when Texas was able to supply about 80 per cent of the additional oil for war because it had conserved its resources carefully during the preceding decade. Today, the principles of conservation are widely accepted and supported by oil men throughout the State.

VIII.

The rapid development of East Texas production following 1930 caused a reduction in the output of other producing areas in the State. Active exploration continued, however, and it was only a matter of a few years before production turned upward again in the Gulf Coast, Southwest Texas, North Texas, and West Texas. The decade of the thirties may be termed the "golden age of oil finding in Texas." This was due principally to the extraordinary success of geophysical methods. Many important fields were found in the ten-year period following East Texas—Conroe, Thompsons, Hastings, Tomoconnor, Anahuac, Talco, Seeligson, Slaughter, Wasson, Webster, and Hawkins are among the names that stand out. During this interval the proved reserves of crude oil in Texas were greatly increased and many thousand new wells were drilled.

The development of new fields ceased to attract public interest because wells were no longer allowed to flow in the unregulated manner that characterized the era from Spindletop to Powell. Development and production was carried on in an orderly manner under spacing and other rules promulgated by the Railroad Commission of Texas under the conservation statutes. The oil industry became a stabilized, large-scale business that had lost some of the glamour of the early days. Scientific methods have been applied to every phase of the industry's operations. Electrical surveys are made of wells to determine the location, extent and character

HERE THE ARTIST HAS CAPTURED IN TODAY'S OMINOUS LOOKING RUINS THE WASTE AND FOLLY OF EARLY BOOM FIELDS

FROM HUGE MODERN PLANTS LIKE HUMBLE'S BAYTOWN REFINERY FLOW UNTOLD NUMBERS OF QUALITY PRODUCTS

of potential producing sands. Wells are carefully completed and perforated with the most modern equipment to insure efficient production. New and better drilling rigs have been devised, capable of drilling 16,000 feet down in the search for oil. Exploration for and production of oil, in other words, has become a science involving large investments and efficient techniques. There are many instances where millions of dollars are spent in exploration, in the acquisition of leases, in the drilling of exploratory wells, and in the actual completion of producing wells before substantial production is established from a new field. A single well sometimes costs $500,000, and many wells cost over $100,000. It is natural that such investments should be based on the best technical knowledge available and not left to the chance methods of earlier days.

IX.

Oil is where you find it, but to convert oil into energy for the use of man, it must be refined and the refined products delivered to the point of consumption. So the development of pipe lines and refineries has parelleled the development of Texas' oil production. There are today a total of 23,000 miles of trunk pipe lines in Texas, and 13,500 miles of gathering lines. And they serve a double purpose—they are not only transporters of oil; they provide a market outlet for all the oil in the fields they tap. It is customary for purchasers to take oil ratably from all wells in a field, and to pay each producer and royalty-owner on the basis of a posted—not a contract—price.

And the refineries! They are a story in themselves. Refining methods are so continuously improved and new products so frequently added to the list that it can be truthfully said that a modern oil refinery is never quite finished. Consider the products that come from such a plant as Humble's Baytown refinery; gasoline of various descriptions for airplanes, automobiles, tractors; lubricating oils and motor oils; diesel oils; fuel oils; asphalts; waxes; synthetic rubber; kerosene; cleaning fluids; solvents; rust preventives; and scores of other products. If it can be made from hydrocarbons, the refinery chemists probably can make it; and if it is of widespread usefulness to man, they will devise ways to make it in quantity for marketing at a low price.

The scientific and business-like development of Texas' oil resources of the last two decades has resulted in great benefit to every citizen of the state. Mention has already been made of the oil owned by the University of Texas and Texas A. & M. College. Through 1945, their income from oil leases and bonuses on land and royalties on oil production has amounted to nearly $55,000,000. In many counties, oil maintains the school system with the taxes it pays. The gasoline tax is the chief source of revenue for highway construction and maintenance.

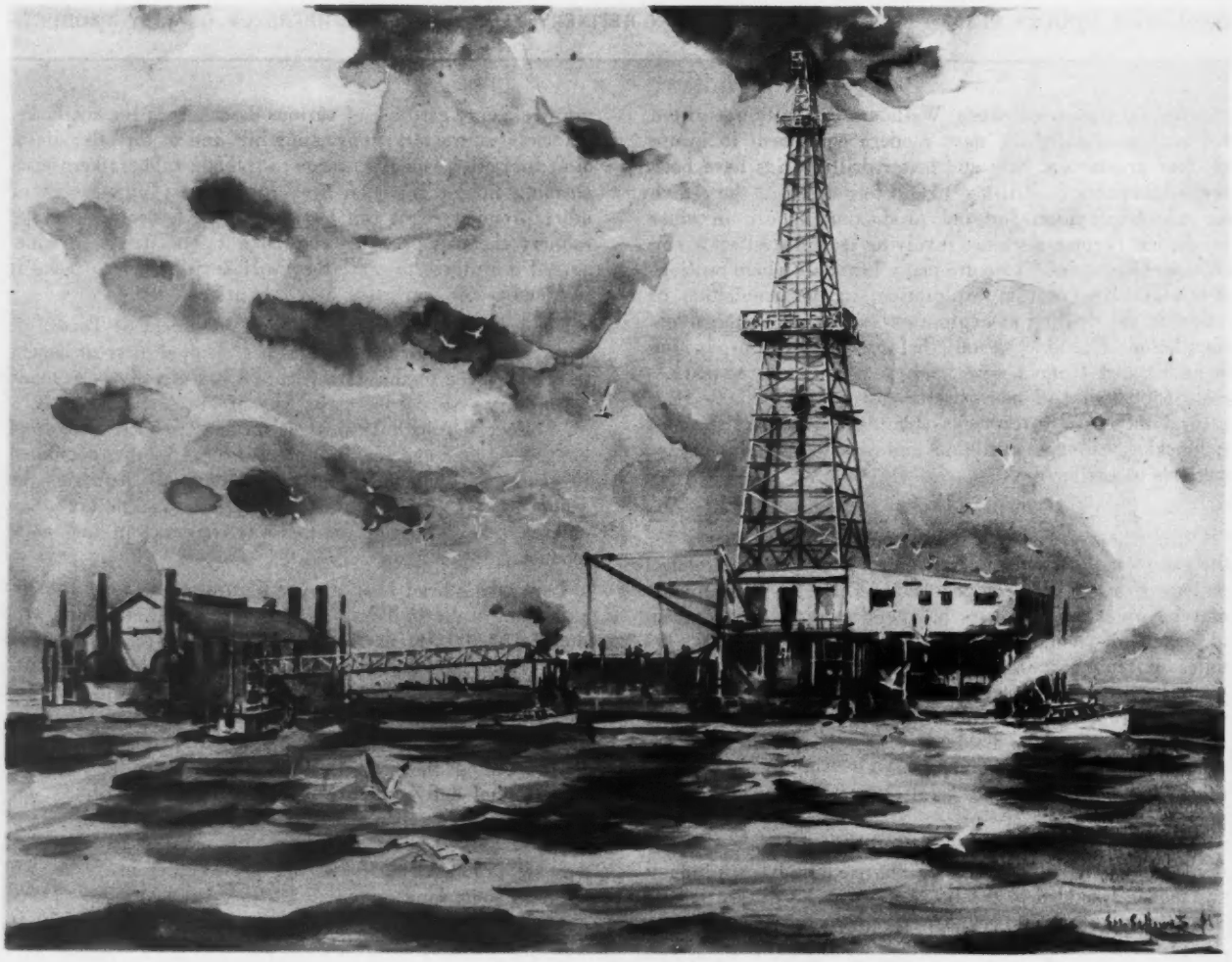
Let's take a brief look at some figures. There were 103,000 producing wells in Texas on December 31, 1945; they produced 754,000,000 barrels of oil in 1945; this production came from 950 different fields and was valued at $920,000,000. Texas' production was 45 per cent of the total for the United States, and the proven reserves in Texas on December 31, 1944, were 11,375,000,000 barrels, 55 per cent of the United States total. There are in Texas 85 refineries with a total daily capacity of 1,400,000 barrels of oil, and 190 natural gasoline and cycling plants recovering about 140,000 barrels daily by processing natural gas. Oil and gas are produced in 183 of the 254 counties in Texas, and there is some land under oil leases in every county. Truly, the oil industry affects nearly every citizen in the State, either directly of indirectly.

Oil is a commodity of even greater importance in war than it is in peace. When the United States entered World War II on December 7, 1941, the great petroleum industry was ready to meet the enormous demands of global war. The allies floated to victory on fuel oil in World War I. In World War II, they not only floated on fuel and diesel oils, they also flew and rolled to victory on gasoline. Texas' contribution to the war was heavy and in many different ways; but the two chief essentials furnished by the State were men and oil. As to manpower, Admiral Nimitz said recently: "Relatively more Texas men and women entered the armed services than those of any other state. About 500,000 entered the Army, 175,000 came into the Navy, 28,000 into the Marine Corps, and 8,000 into the Coast Guard." As to oil, Texas' production increased by 60 per cent, reached a maximum level of 2,200,000 barrels daily just prior to the end of the war, and amounted to the staggering total of 2,580,000,000 barrels during the years 1942-45. Texas refineries made 120,000,000 barrels of 100 octane aviation gasoline, or 40 per cent of the U. S. production. On December 14, 1944, Humble's Baytown refinery became the first in the United States to produce 1,000,000,000 gallons of 100 octane aviation gasoline at a single plant. To these examples could be added many others to show how much of the oil for war was supplied from Texas. It is still too close to the event actually to get a full perspective on the war effort of Texas' oil industry, but it is already clearly apparent that the final story will tell a record of accomplishment of which every oil man and every Texan will be proud.

X.

And there you have it, a sketch of the discovery and development of oil in Texas. This is only a quick glimpse of the highlights in an industry which has given the Nation's largest state adventurous incident and economic advantage in equal, large measure. This account, which was not intended to be an exhaustive historical study, will have served its purpose if it has awakened in the hearts of old-timers a nostalgia for the old, exciting days in the Texas fields, and if it has recorded for younger readers some of the colorful chronology in the early life of the adult industry they know. These highlights, we hope, will stimulate interest in the oil industry—an industry complex in its structure, utilizing every science, and making a contribution to the wealth and welfare of Texas and the United States which can be described only in superlative terms.

BIG SUBMERGIBLE BARGE RIGS MAKE DRILLING FOR OIL POSSIBLE IN LAKES, SHALLOW BAYS AND COASTAL MARSHLANDS



Desert NUISANCE

Monahans Desert proves fickle landlord as shifting sands alternately expose and recover Company's lines

LINE RIDER checks a stanchion under a section of line which has been exposed by shifting sand. Use of stanchions to prevent line breaks is one of the most common remedies in Monahans Desert.

The rippling white sands of the Monahans Desert of West Texas may be the tourist's delight, the historian's opportunity, and the sight to send a photographer into cartwheels of enthusiasm; but, for the pipeliner, these sand dunes are just another obstacle to surmount, another challenge to his traditional unwillingness to let nature block his route.

Shifting sand dunes are located in limited spots on several sections of Humble Pipe Line Company's right-of-way in West Texas and New Mexico, but the most notable instance is the 20-mile stretch across the Monahans Desert, between Winkler Station and Crane Station, in Winkler and Crane counties respectively.

Back in 1928 when this section of threaded and coupled line went down, it took men three days and nights to cross the desert in a stripped wagon train to make just the preliminary route chart. So impassable were the dunes for heavy vehicles that pipe had to be dragged across the sand, a section at a time, by mule teams.

Tons of loose sand were excavated from the right-of-way before the ditch could be dug, and finally the line was laid across the sandy waste in just as level a trench as it was possible to dig. The pipe was buried the law-prescribed 18 inches below the ground.

However, the desert is a fickle landlord. It just will not stand still. The winds that whip across its surface constantly and the severe dust storms which plague the desert every spring cause the sand dunes to shift. Land that may have been level when the line was constructed might become hilled and hollowed.

Sand can and does blow from under portions of the line, leaving the pipe exposed and swinging, with the danger of breaking from lack of support. By the same token, line that had been exposed, might be buried again.

There is no way of determining how long it takes to expose a length of pipeline—in some instances it takes months or years for the gradual erosion, while at other times sections may be exposed virtually overnight in a severe dust storm.

However, pipe line maintenance men do not consider the care of this line a major problem; rather it is a nuisance, one that constantly taxes their ingenuity and forethought.

Naturally the most economical measures are taken in trying to keep the line in its elusive trench, since the entire picture may change from day to day as the sand shifts with the wind.

One of three remedies is prescribed for the situation, the remedy depending, of course, on the seriousness of the exposure. Since it is quite possible that the next dust storm might rebury an exposed section, the favorite remedy is: where lines are exposed to the extent that they need support, stanchions are placed under them.

The second method is to use bulldozers to push the sand back under and over the exposed areas. The third remedy is used only on rare occasions where the line is exposed in a high arc and perhaps where even supporting stanchions have been undermined by shifting sands. The remedy is cut the line and rebury it.

Of course the hero of these little daily dramas of man against the ele-

DESERT LINE RIDER O. S. Townsend checks stanchions under a section of line exposed by shifting sands. Below, sectional exposure shows how tricky desert sand can be.

ments is the desert pipeline rider, whose duty it is to inspect the desert-bound line on a regular schedule. While it is his responsibility to look after the nuisance inroads of erosion on the Company's pipe line system, he has his own little battle with the wind and sand, his own personal obstacles to overcome.

Here again, his ingenuity is demonstrated. Over the years, a system has been worked out whereby these men have been able to "tame the wilderness" enough to make their jobs more comfortable and less difficult.

While the initial pipe line route-planning trek across the desert was made with wagons stripped to their running gear to make it easier for teams to pull them through deep sand and loaded only with necessary food and water, the present day line driver makes his inspection via automobile.

First, he had to learn how to take his car through the desert sands without danger of becoming hopelessly stuck. Thus he learned to equip his automobile with over-sized tires which he de-

MRS. TOWNSEND, who sometimes accompanies her husband, helps him shovel out of the sand. Despite oversize tires and deflation to make travel through sand easier, it is not an uncommon experience to get stuck. Shovels are an important part of line rider's full supply of equipment.

WHILE INSPECTING a section of line that has been exposed line rider O. S. Townsend and his wife find that one of the supporting stanchions has been blown over.

flates to ten pounds pressure before starting the trip over the sand. At the end of the run, he reinflates the tires with an engine pump before driving back onto the highway from the desert.

Deflated tires enable the vehicle to move over the sand with less danger of sinking into soft spots. Occasionally, however, it does stick, and then it's up to the line rider to get out his handy shovel and dig his way out.

He has learned that wet sand is much easier to drive over than dry, loose sand, so it has become customary to start the run early in the morning while the night's moisture is still on the desert. Too, the few rains which fall in that arid land create ideal traveling conditions for the desert rider.

Of course there are other precautions, too numerous to mention here, which anyone making the desert run must take to insure a trouble-free journey. But that's just a part of the thrill of the job for a pipeliner; for be it deserts, swamps, or mountain passes, the challenge no pipeliner can resist is the challenge of besting a difficult situation.

UPON COMPLETING his run through the desert O. S. Townsend reinflates the tires with an engine pump installed on his car especially for that purpose. Normal air pressure is used for highway driving, instead of the 10 pounds pressure which is ideally suited to desert travel.

WELDER STANDING IN MUDDY MARSH TIES ON ANOTHER 200-FOOT SECTION OF PIPE IN PREPARATION FOR PUSH JOB

Out of the Marsh to Market

Gas pipe line through Louisiana marshes presents construction problems

AQUEDUCTS for delivering water from bounteous sources of supply to areas of demand date back to the time of Ramesis II, in the 14th century B.C. In Babylonia, in Assyria, and in Egypt great stone flumes were constructed to bring from distant points the water needed for irrigation and for other purposes. In the early centuries of modern time the Romans built numerous giant aqueducts; in medieval times a considerable number were constructed in several European countries; and even today modern versions of these historic structures are still being cut across vast distances in our own land.

Nothing but the greatest admiration must be ours for those ancient engineers and workmen who fashioned the vast supply systems with nothing more than a strong will to do, crude materials to do with, and a vast amount of manpower. Horsepower, as we know it today, played no part in the construction of those numerous monuments to early man's ingenuity.

Since modern oil and gas pipe lines are historically the outgrowth of the early aqueducts, it is not unnatural that comparisons be made. But lest we spend too much of our admiration on the accomplishments of the ancients, let's consider the modern engineers and workmen who have all the known mechanized power at their disposal to build a pipe line but who find themselves working in terrain that forbids the use of the equipment and its horsepower capacity in the customary manner.

Just such is the case of Humble Production department engineers and contractors who are nearing completion of a 14-inch gas pipe line across 65 miles of Lower Louisiana. While the upper 43-mile section is being laid across comparatively normal farming country and narrows itself down to little more than a routine pipe line job, the lower 22 miles traverse some of the worst marshlands in a state which can lay claim to the softest, deepest, and most forbidding marshlands in America.

Originating point of the line is at Pecan Island, a muddy spot on the bank of a canal which runs through this boundless, flat marsh country near the southern extremity of Vermilion Parish. Here a separation-dehydration plant is being

built to remove the liquid hydrocarbons from the gas-distillate production of Humble wells in the Pecan Island field and to supply an estimated 60 million cubic feet daily of dry gas for shipment northward through the new line to Interstate Pipe Line Company at a point about seven miles southwest of Opelousas, Louisiana.

While the function of the line is important—to bring out of the marsh to market a considerable quantity of gas for home and industrial consumption—details on the methods and techniques employed by the line builders seem to be of paramount interest.

Headquarters for the unique construction job are at Abbeville, easy-going Evangeline country village, nestling quietly on the sluggish Vermilion River. Here live the people who work on the line; here also is located the coating plant where a special, heavy asphaltic coating is applied to the pipe before it is hauled out to the job, first by truck and then by barge and tug.

To get the genuine, unadulterated feel of this marsh project, let's accompany the crew for a few days.

It's six o'clock in the morning and they're already stirring around town, these pipeliners of the marshes, seeking breakfast and a lunch to carry out on the job. After washing down a substantial breakfast with several cups of black French coffee (which tastes wonderful but looks like liquid tar) they begin their 15-mile ride southward in trucks and cars. The road is graveled and fairly wide at the outset, but it gradually becomes narrower until it ends abruptly at Intracoastal City, a small community housing the families of personnel operating the locks on the intracoastal canal at that point. A short distance north of here crew members leave their cars and trucks and board a crew boat which takes them several miles down the canal to an operating high point.

A high point, by way of explanation, is a canal bank which may be from four to 10 feet above the level of the marsh. Since the almost bottomless marsh prohibits the use of heavy machinery for laying the line in the conventional manner, construction engineers had to find at least six such high points along the route of the line to make possible its construction.

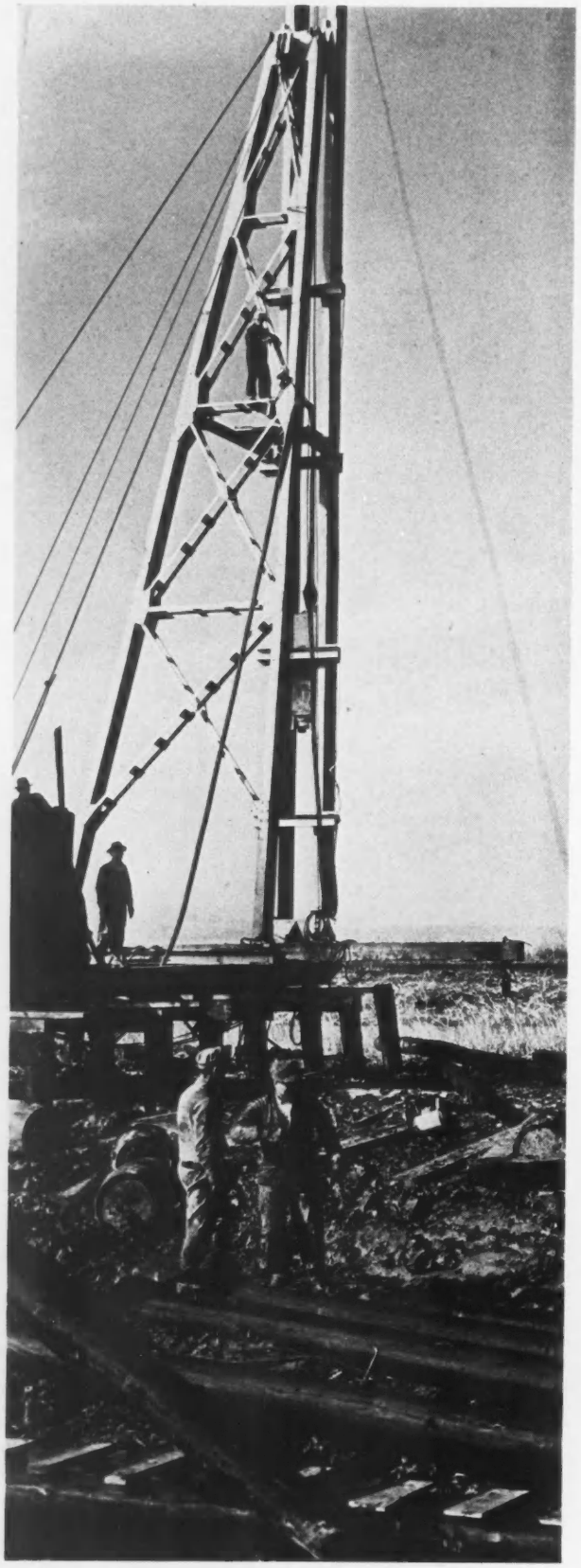
From these high points, like command posts on a field of battle, engineers wage their war against the sea of mud. Here supplies are concentrated, here the heavy tractors with their antennae-like booms may rest awhile from their struggle with the heavy loads and forbidding terrain. These high points are the intermediate goals toward which the foot-soldiers of this battle of the marsh, the pipe line crews, forge wearily—mileposts on the way to market.

The day is bitter cold and up on the canal bank the blustering north wind strikes with full fury on the crew. Wrapped in heavy clothing and wearing high rubber or heavy leather boots they plod slowly through the heavy mud on their routine chores, making it a point occasionally to figure out a legitimate stop at the temporary windbreak set up on the bank and warm their hands at the butane fire hissing in an old oil drum.

From the canal bank the scene is anything but an inviting

ALL SUPPLIES have to be brought to high points by boat. Here lumber for board road and fuel and lubricants for tractors and other machines are unloaded at improvised docks along the canal bank.

THE KIND OF MUD that sticks to everything and sucks men's energy is everywhere on the job. On the canal bank tractors cut deep gashes through the quagmire; when they start out into the marsh their only salvation is the board road laid down beside the ditch in the limited area where they deliver sections of pipe and guide them on push jobs.



one. The entire width of the bank is a quagmire, churned to consistency of biscuit dough by the great treads of the big tractors. Beyond that a vast sea of marsh stretches to the horizon, the charred stubble of marsh grass burned by muskrat trappers lending a somber brown hue to the otherwise colorless expanse. Knifing through it like a youngster's kite string arching across a blue spring sky is the water-filled ditch, made not by a modern ditching machine but by a plow hitched between two marsh buggies, the only vehicles capable of negotiating the spongy marshlands.

While you take in the scene, crew members go ahead methodically with their assigned tasks. Several big tractors, "cats" to the pipe line fraternity, churn through the muck to latch on to lengths of pipe down at the water's edge and jerk and drag them up to the pipe rack. Here, welders tie them together into 200-foot sections.

You observe a bucket brigade in action and you begin to wonder what they are carrying. Over at the pipe rack you see operators clamping a set of heavy steel jaws around the uncoated sections where the welders have finished. The steaming asphaltic material brought in buckets from the nearby heating unit is dumped into the steel jaws and they are then closed and allowed to set for a while. Later you notice that such a smooth coating job has been done by this method that it is difficult to detect where the machine coating stops and manual coating begins.

Gliding through the dark water of the canal comes a supply boat. As it is made fast at the improvised dock you begin to wonder what it brings. Well, there are barreled goods—fuel and lubricants for the tractors and other machines. Crew men wrestle the big drums up the canal bank laboriously. Then there is lumber—rough, heavy boards for which there is no apparent need. But then you remember that alongside the ditch there must be a board road so that the big tractors can deliver the 200-foot sections of pipe and guide each section as it is pushed into the ditch. Without these solid board roads, you learn, the huge cats would sink hopelessly in the soft marsh.

The first 200-foot section is ready for the ditch. Two "cats" jockey it into position over the ditch and lay it on skids. There go the welders again! They are going to weld to the front end of the section a huge "bull plug"—a closed end section of lighter pipe that will act as a buoy to keep the pipe from being pushed into the mud of the ditch. A short distance out in the marsh, set on pontoons astride the ditch, is a powerful winch pulling machine. A steel rope with hook is extended from the machine to the back end of the 200-foot section up on the canal bank, and as the winch operator speeds up his motor and sets it in gear the length of pipe begins to slide slowly between the pontoons of the pulling machine and out into the ditch. Back near the canal bank one of the cats crawls along guiding the pipe as it slides slowly along.

Whence comes the term "push job" when actually the pipe is pulled into the ditch?

That is answered much more easily than it is actually done. Each succeeding 200-foot section has to be placed in the ditch exactly like the first one, and that means that each time a section is pulled in, all previously laid sections must

A MUDDY SPOT on the bank of a canal near Pecan Island is the site for the separation-dehydration plant. Workmen fight mud at every turn to drive long piling into the marsh to form a foundation for the plant.

be pushed ahead of it out into the marsh. Thus, when the equipment's maximum push capacity of somewhere around 15,000 feet of heavy pipe is approached, each 200-foot section added must push ahead of it many tons of weight.

Since the maximum push capacity is about three miles, it is plain to see that high points, work spots suitable for heavy equipment, had to be selected no more than six miles apart so that a maximum push in both directions from any given high point would make possible the meeting of the two sections. From several high points much shorter push jobs were required.

As if mud alone were not enough, this pipe line job is plagued by numerous water crossings. Numerous canals cut across the marsh country and present another problem to tax the ingenuity of the pipe line engineers. On the canal banks, the pipe to traverse the canal must be pre-bent to conform to the contour of the waterway's bottom. Then watching their chance, the engineers must lay the pipe accurately to join the straight lengths on either side of the canal, yet hurriedly so as not to interfere with essential marine traffic.

Thus, slowly, painfully the heavy 14-inch pipe line is being laid. The project is a constant battle of men and machines against mud—thick, clinging gray mud that sticks to machinery like glue and makes footing treacherous and walking slow and wearying.

Little wonder that when the crew takes time off for lunch there is brought forth from lunch kits and paper bags a bounteous supply of food—slabs of cheese, thick sandwiches, and lots of fruit. While they eat they talk shop—about the cold, the ever-present mud which sucks their energy, about how long it will be before they move on to the next high point. Always it seems to take longer than they expected; always there is weather or equipment trouble, or a shortage of material to slow progress.

An idea of the time involved in the construction of a pipe line under such conditions may readily be gained by studying the job time table. Work was started on the 22-mile marsh section around the middle of November, last year. It is anticipated that it will be ready to carry gas out of the marsh about March 1 of this year.

All pipe, machinery, fuel, lumber and whatever other supplies are needed have to be hauled out by barge and tug. Facilities for loading and unloading have to be improvised at each high point, and with the completion of a maximum push job the entire transfer of materials and equipment has to be made all over again. Obviously, maintenance of equipment is a difficult task when everything becomes caked with adhesive mud at every turn. Men move slowly and cautiously in the mire. Rain and cold slow down the work. The marsh is forbidding enough in its own right, but when winter rains are added to that natural handicap, conditions at times tend to become almost despairing.

But rain or shine, the line is progressing. Certainly by early spring gas from the deep marsh country of southern Vermilion Parish will be flowing to market through Humble's Pecan Island Gas System line—a line that has been both expensive and difficult to build, a line that was not laid but was pushed into its marshy bed.

THE BIG CATS struggle through the mud to swing the heavy 200 foot sections from the pipe rack out to the ditch. Below is a view of a push job taken from the platform of the pontoon-mounted pulling machine. The tractor guides the pipe as it slides slowly into the ditch.

By the way . .

Through the Company's Coin-Your-Ideas Plan a total of $2,975.00 was distributed to employees for their suggestions made during the fourth quarter of 1945. One hundred employees benefitted from the sum of $2,050.00 made in initial awards; seven employees received a combined total of $925.00 in the form of supplemental awards on ideas which were granted initial awards during the fourth quarter of the preceding year. Leadership went to employees in Refining, with 80 awards totalling $2,275.00 being made in that branch of operations. Twenty-seven awards were granted to employees in Production for a total of $670.00; and Houston Office and Miscellaneous awards totaled two for $30.00.

Retirements

MRS. CLARA CALLAWAY TAYLOR, Houston Office receptionist, on December 12 . . . WILLIAM C. ARNETT, general salesman at San Antonio, on December 22 . . . JESSE R. MARTIN, pumper in Colorado Production, December 16 . . . GENERAL H. TAYLOR, East Texas Gas Plant repairman, December 21 . . . CHRISTOPHER H. HORNSBY, rotary driller at Maurbro, on December 1 . . . WILLIAM P. SLAUGHTER, oiler at Comyn Station, December 2 . . . FRANK C. HELMER, Baytown Refinery, on January 6 . . . HENRY E. MCDONOUGH, accountant in Houston Office of Pipe Line Company, on January 5 . . . SAMUEL R. WALKER, SR., carpenter gang pusher at Lovell Lake Production, on January 8 . . . GASPER L. WADDELL, machinist at Baytown Refinery, on January 8 . . . JAMES A. DEVINE, shift supervisor at Baytown Refinery, on January 11 . . . and JOHN F. DZILSKY, contract lube foreman at Baytown Refinery, on January 31.

Transfers and Promotions

Recent changes in production department supervisory personnel are as follows: C. M. VARDAMAN, Talco district superintendent, was transferred to the Stratton district in the same capacity . . . HENRY W. ROBERSON, assistant superintendent, Pickton district, was promoted to district superintendent of Navarro Crossing district . . . V. O. HARRIS was promoted to Talco district superintendent . . . JAMES H. GALLOWAY, recently returned from military leave, was transferred from the Kelsey district to superintendent of the Sullivan district . . . OLIVER L. FURSE, district petroleum engineer at Hobbs, was made assistant district superintendent of the Pickton district . . . WILLIAM A. CASTILLE was appointed assistant division petroleum engineer, Louisiana division . . . MURRAY H. CUNNINGHAM, Natchez district civil engineer, has returned from military service . . . JOHN S. HACKER was promoted to district civil engineer, North Crowley district . . . BAILEY S. HYDEN was promoted to district civil engineer at Lovell Lake and WILLIAM E. NEILL was promoted to the same post in the Paradis district . . . CHARLES E. ULLRICH, Katy Gas Plant civil engineer, was made civil engineer of North Katy district . . . DON F. SHAW, recently returned from military leave, was transferred from his former post as district petroleum engineer in Government Wells district to Flour Bluff district . . . TOM E. BEAIRD, JR., petroleum engineer in the East Texas division office, was transferred to Navarro Crossing district and promoted to district petroleum engineer . . . and HAROLD M. DAVIDSON, assistant chief clerk at Talco, was transferred to Navarro Crossing district and promoted to district chief clerk.

Deaths

JOHN R. DOGGETT, 52, district chief clerk at Friendswood, died on November 28 . . . KIRBY D. ROBINSON, 42, chief rotary derrickman at Lovell Lake, on November 30 . . . JAMES M. BLANKENSHIP, 64, stock gauger at Comyn Station, HPL, on December 1 . . . GEORGE KLEINWORTH, 49, service station checker, Houston Sales, on December 9 . . . ERNEST S. MOORE, 46, boilermaker at Baytown Refinery, on December 11 . . . CLARENCE R. ATHERTON, 43, assistant storekeeper at Baytown Refinery, on December 20; ELZIE C. CANNON, 41, relief pumper in Gauging department, Baytown Refinery, on December 23 . . . and WYNN O. EWING, 43, shift foreman at Baytown Refinery docks, on December 24. Humble annuitants who have died since last publication date are: ALVIN R. GREGORY, 65, former rotary driller in Wasson district, on December 24 . . . FRANK P. OSBORNE, 61, former engineer at Katy Station, on January 4 . . . and RAYMOND E. POWELL, 58, former assistant general manager of Refining, on January 16.

The HUMBLE WAY

VOLUME 1 JANUARY-FEBRUARY NUMBER 5

Gasoline Line to North Texas..... 1
Trapping Metal Mice..... 2
Barge Workover Rig..... 6
Highlights of Texas Oil..... 9
Desert Nuisance.....21
Out of the Marsh to Market.....24
By the Way.....28

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HUMBLE OIL & REFINING COMPANY

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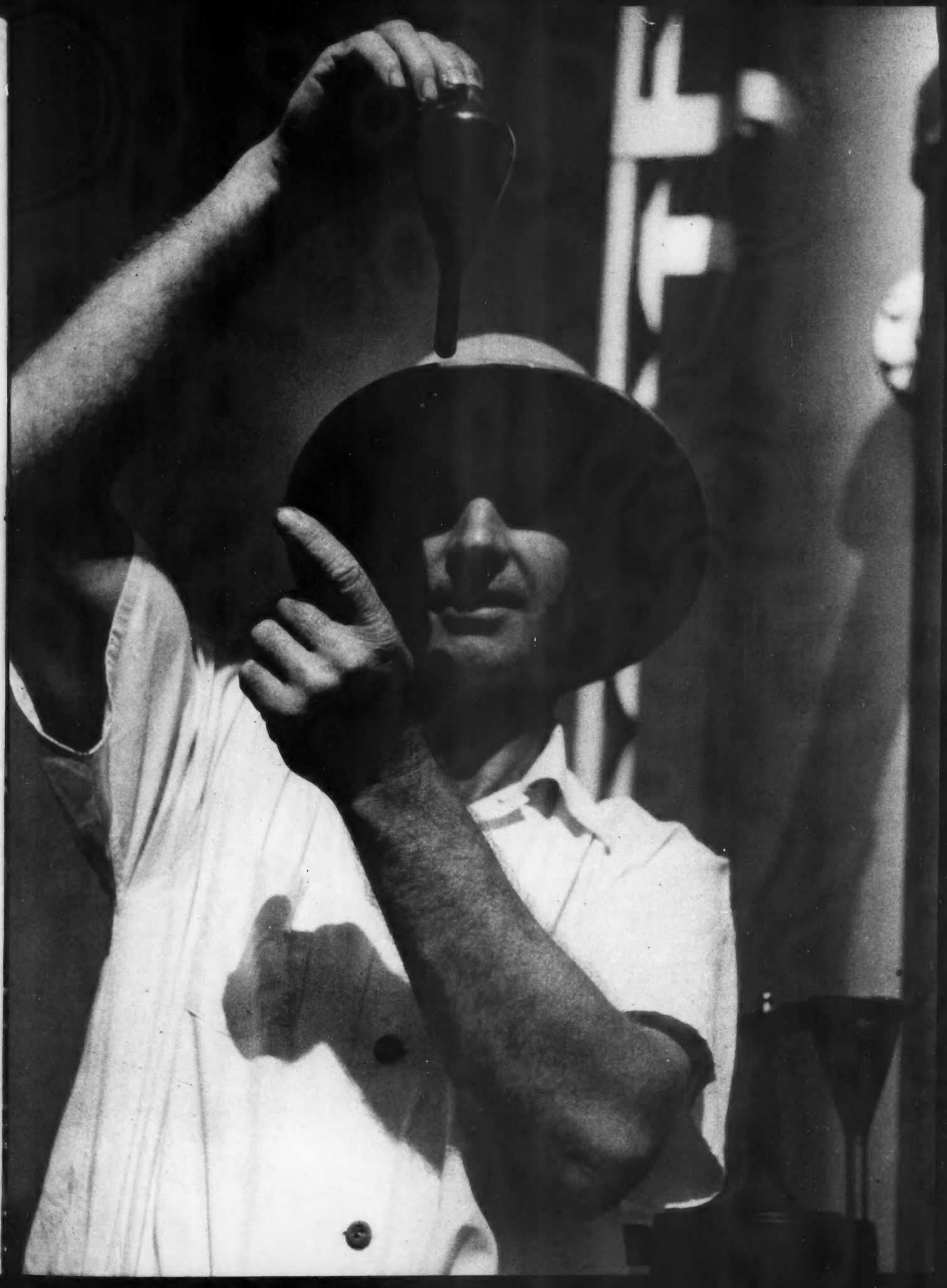
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